ENERGY AND WATER DEVELOPMENT APPROPRIATIONS FOR 2015

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE

COMMITTEE ON APPROPRIATIONS

HOUSE OF REPRESENTATIVES

ONE HUNDRED THIRTEENTH CONGRESS

SECOND SESSION

SUBCOMMITTEE ON ENERGY AND WATER DEVELOPMENT

MICHAEL K. SIMPSON, Idaho, *Chairman*

RODNEY P. FRELINGHUYSEN, New Jersey
ALAN NUNNELEE, Mississippi
KEN CALVERT, California
CHARLES J. FLEISCHMANN, Tennessee
TOM GRAVES, Georgia
JEFF FORTENBERRY, Nebraska

MARCY KAPTUR, Ohio
PETER J. VISCLOSKY, Indiana
ED PASTOR, Arizona
CHAKA FATTAH, Pennsylvania

NOTE: Under Committee Rules, Mr. Rogers, as Chairman of the Full Committee, and Mrs. Lowey, as Ranking Minority Member of the Full Committee, are authorized to sit as Members of all Subcommittees.

ROB BLAIR, ANGIE GIANCARLO, LORAINE HECKENBERG,
BEN HAMMOND, and PERRY YATES,
Staff Assistants

PART 6

DEPARTMENT OF ENERGY

Printed for the use of the Committee on Appropriations

U.S. GOVERNMENT PRINTING OFFICE

91–276 WASHINGTON : 2014

COMMITTEE ON APPROPRIATIONS

HAROLD ROGERS, Kentucky, *Chairman*

FRANK R. WOLF, Virginia
JACK KINGSTON, Georgia
RODNEY P. FRELINGHUYSEN, New Jersey
TOM LATHAM, Iowa
ROBERT B. ADERHOLT, Alabama
KAY GRANGER, Texas
MICHAEL K. SIMPSON, Idaho
JOHN ABNEY CULBERSON, Texas
ANDER CRENSHAW, Florida
JOHN R. CARTER, Texas
KEN CALVERT, California
TOM COLE, Oklahoma
MARIO DIAZ-BALART, Florida
CHARLES W. DENT, Pennsylvania
TOM GRAVES, Georgia
KEVIN YODER, Kansas
STEVE WOMACK, Arkansas
ALAN NUNNELEE, Mississippi
JEFF FORTENBERRY, Nebraska
THOMAS J. ROONEY, Florida
CHARLES J. FLEISCHMANN, Tennessee
JAIME HERRERA BEUTLER, Washington
DAVID P. JOYCE, Ohio
DAVID G. VALADAO, California
ANDY HARRIS, Maryland
MARTHA ROBY, Alabama
MARK E. AMODEI, Nevada
CHRIS STEWART, Utah

NITA M. LOWEY, New York
MARCY KAPTUR, Ohio
PETER J. VISCLOSKY, Indiana
JOSÉ E. SERRANO, New York
ROSA L. DELAURO, Connecticut
JAMES P. MORAN, Virginia
ED PASTOR, Arizona
DAVID E. PRICE, North Carolina
LUCILLE ROYBAL-ALLARD, California
SAM FARR, California
CHAKA FATTAH, Pennsylvania
SANFORD D. BISHOP, JR., Georgia
BARBARA LEE, California
ADAM B. SCHIFF, California
MICHAEL M. HONDA, California
BETTY MCCOLLUM, Minnesota
TIM RYAN, Ohio
DEBBIE WASSERMAN SCHULTZ, Florida
HENRY CUELLAR, Texas
CHELLIE PINGREE, Maine
MIKE QUIGLEY, Illinois
WILLIAM L. OWENS, New York

WILLIAM E. SMITH, *Clerk and Staff Director*

ENERGY AND WATER DEVELOPMENT APPROPRIATIONS FOR 2015

TUESDAY, APRIL 8, 2014.

ENVIRONMENTAL MANAGEMENT FY 2015 BUDGET

WITNESS

DAVE HUIZENGA, ACTING ASSISTANT SECRETARY, ENVIRONMENTAL MANAGEMENT, DEPARTMENT OF ENERGY

Mr. SIMPSON. I would like to call the hearing to order.

Sorry, we are about five minutes late starting, but good morning, everyone.

We have before us today David Huizenga, Senior Advisor for Environment Management to the Secretary of Energy. We welcome you back to this Subcommittee.

Mr. Huizenga, we greatly appreciate the work you have done over the past two years. Leading a program that is fraught with such daunting technical, management, and regulatory challenges is no easy task. We look forward to your testimony on these important cleanup activities.

The budget request for the Office of Environmental Management totals $5.6 billion, $209 million, or a 3.5 percent decrease below the fiscal year 2014 enacted level. I do not include in those figures the $463 million for a federal contribution to the Uranium Enrichment Decontamination and Decommissioning Fund that has served to mask the reductions in the request for the department's cleanup activities.

The department is currently facing some very difficult challenges in its cleanup program. What has been proudly referred to in the past as the nation's only operating repository, the Waste Isolation Pilot Plant, is currently not operating. The recent activities at WIPP are very serious, and by all accounts are likely to have a significant impact on conduct of the operations there. We hope to hear more from you today on how you are ensuring the safety of the public and our workers, as well as how the events at WIPP will impact cleanup plans there and at other sites. The public's faith and confidence in the department's ability to protect public health and the environment as it carries out its mission is at stake.

That confidence will be particularly important as the department enters into negotiations to modify its cleanup agreements. The department has either already missed, or is poised to miss, cleanup milestones at a number of sites. As a result, the department is looking to change the terms of its cleanup agreements so that it can move forward with more feasible plans. If those proposals are to be considered credible, the department must address an embedded culture that has allowed poor project management and weak quality practices to impact progress.

We are eager to hear what progress you have made to change the course of this program so that the department can safely and reliably meet its commitments.

Please ensure for the hearing record that responses to the questions for the record and any supporting information requested by the Subcommittee are delivered in final form to us no later than four weeks from the time you receive them. I also ask that if members have additional questions they would like to ask, to submit them to the Subcommittee for the record, and that they do so please by 5 p.m. tomorrow.

With those opening statements, I would like to yield to our ranking member, Ms. Kaptur for any opening comments that she might have.

Ms. KAPTUR. Thank you, Mr. Chairman, and welcome, Mr. Huizenga for being here today. It is good to see you again. And thank you for taking time to discuss the environmental program with us.

Obviously, your program has massive challenges and responsibilities, and the legacy of the Manhattan Project is an obligation we, as a country, must continue addressing. One of the supplements to our hearing notes this morning, obviously, showed the historical cleanup sites and the sites remaining, and I think overall we have to say the country has made enormous progress, and we want to hear about that progress today. You are one of the stewards of that effort, and a most important one.

The recent shutdown, however, of the Waste Isolation Plant and the changes the department is pursuing at Hanford are illustrative of not only the dangers posed by remaining materials, but also the technical and budgetary challenges that further complicate the eventual success of your department's efforts.

Further, I have lingering concerns about the department's safety culture. With such a critical mission at stake, the work environment at your sites must ensure employee concerns are addressed in a timely manner and without fear of retribution, for heaven's sake.

Given the constrained fiscal environment, it will be crucial that all resources are employed to their fullest potential. In this austere budget setting, issues of project management and corporate governance are increasingly vital to the success of the department's mission. The department must follow through with strong leadership and fundamental management reform, and failing to do so will significantly inhibit the execution of this mission, as well as the department's credibility.

I hope that you will take some time today to update us on your actions in this regard, and I look forward to our discussion today.

Finally, Mr. Huizenga, I would like to thank you, your staff, and OMB—and yes, you heard that correctly, OMB—for partially addressing my concerns about Portsmouth funding. Last year, the site had a $44 million shortfall, in large part because of reduced proceeds from uranium tailings. And I worked with the chairman and our Senate colleagues to ensure that layoffs due to funding shortfalls in 2014 would not occur. The budget request for 2015 has increased appropriated funding for the site by $22 million in recognition of the softness in the uranium market.

As you know, the site is not in my district, but it is in my state, in one of the highest unemployment counties in the country. Ohio cannot afford additional job losses, and I appreciate your attention to these concerns as we move forward on many fronts, certainly in the strategic battles arena.

Thank you, Mr. Chairman, for the time, and we look forward to your testimony.

Mr. SIMPSON. Thank you.

Mr. Huizenga.

Mr. HUIZENGA. Thank you, Mr. Chairman. Good morning to you and to Ranking Member Kaptur and other members of the Subcommittee. I am pleased to be here today to represent the Department of Energy's Environmental Management Program, to discuss the many positive things that we have been doing under this program, what we have achieved, and what we plan to accomplish with the 2015 budget request.

The request of $5.62 billion will allow the Environmental Management Program to continue the safe cleanup of the environmental legacy brought about from five decades of nuclear weapons development and government-sponsored nuclear energy research. The request, as you noted, Mr. Chairman, includes $4.865 billion for defense cleanup activities and $463 million for the defense contribution to the UED&D fund, should Congress reauthorize the fund. The request also includes $531 million for the Uranium Enrichment Decontamination and Decommissioning cleanup activities, and $226 million for nondefense environmental cleanup activities.

EM continues to pursue its cleanup objectives guided by three overarching principles. Most importantly, we will continue to discharge our responsibilities by conducting cleanup with a safety-first culture that integrates environmental, safety, and health requirements and controls into all of our work activities. After safety, we are guided by a commitment to comply with our regulatory and our legal obligations. And finally, to be good stewards of the financial and natural resources entrusted to us.

This year marks the 25th anniversary of the Environmental Management Program, and we have achieved a great deal in that time. When EM was created in 1989 as Representative Kaptur has just pointed out, it was charged with cleaning up 107 sites across the country with a total area equal to Rhode Island and Delaware combined. In the 25 years since, EM has completed 91 of those sites and made significant improvements and progress on the remaining 16. Sites like Rocky Flats in Colorado and Fernald in Ohio, both of which were once housing large industrial complexes, are now wildlife preserves that are also available for recreational use.

In December, at the East Tennessee Technology Park in Oak Ridge, we completed the demolition of the K25 building. With the congressmen, we were able to spend some time together seeing the progress we made on what was once the largest building under one roof in the world.

The President's 2015 budget request will allow us to continue to make significant progress in our ongoing cleanup mission. To provide just a few specific highlights of what we will do with the 2015 request, with these funds we will complete the treatment of 900,000 gallons of high-level liquid waste in Idaho. They will allow us to empty the four remaining sites' aging waste storage tanks. We will continue construction of the waste treatment immobilization plant which will allow progress to immobilize the Hanford tank waste into a solid glass form for permanent disposal.

Consistent with the department's objective to immobilize that waste as soon as practicable the 2015 budget includes funding for the preliminary design of the low activity waste pretreatment system. We will also complete clean up of the bulk of the more than 500 facilities along the Columbia River. At Oak Ridge in Tennessee, we will complete the preliminary design for outfall 200 mercury treatment facility, while continuing to develop the technologies needed to ultimately characterize and remediate mercury in the environment. And at the Savannah River site in South Carolina, we will immobilize and dispose of over a million gallons of liquid tank waste and bring the site's high-level waste mission to approximately 50 percent completion.

Before I close, I would like to update you on the situation at WIPP. I'm sure you know, we have had two recent safety events at the facility. The first occurred on February 5, when flammable residues on the surface of a salt truck did catch fire. The second occurred late in the night of February 14th. It was a radioactive contamination event in which some contamination became airborne underground. Although no one has been harmed by either event, we take both very seriously and are committed to identifying, acknowledging, and fixing any underlying shortfalls in our policies or practices. In the meantime, the contamination event does have the potential as you noted to potentially affect other sites where they are currently packaging transuranic waste for disposal at WIPP. We are working to assess potential impacts and make contingency plans to mitigate those impacts when necessary.

In closing, I am honored to be here today representing the Office of Environmental Management. EM is committed to achieving our mission and will continue to apply innovative cleanup strategies to complete our work safely, on schedule, within cost, thereby demonstrating a value to the American taxpayers. We have made significant progress in the last quarter century, and our 2015 budget request will allow us to capitalize on our past investments and successes.

Thank you, and I will take any questions that you may have.

[The information follows:]

Written Statement of David Huizenga
Acting Assistant Secretary for Environmental Management
United States Department of Energy
Before the Subcommittee on Energy and Water Development
Committee on Appropriations
United States House of Representatives

April 8, 2014

Good morning Chairman Simpson, Ranking Member Kaptur, and Members of the Subcommittee. I am pleased to be here today to represent the Department of Energy's (DOE) Office of Environmental Management (EM). I would like to provide you with an overview of the EM program, key accomplishments during the past year and what we plan to accomplish under the President's $5.62 billion Fiscal Year 2015 budget request.

Overview of the EM Mission

EM's mission is to complete the safe cleanup of the environmental legacy resulting from five decades of nuclear weapons development and government-sponsored nuclear energy research. This year is an important milestone year for EM. Fiscal Year (FY) 2014 marks 25 years of solving the legacy environmental problems from the Manhattan Project and Cold War. This environmental legacy includes over 90 million gallons of radioactive wastes stored in aging tanks, thousands of tons of spent (used) nuclear fuel (SNF), over ten-thousand containers of excess plutonium and uranium, over five-thousand contaminated facilities, millions of cubic meters of contaminated soil and billions of gallons of contaminated groundwater. EM was originally charged with the responsibility of cleaning up 107 sites across the country with a total area equal to Rhode Island and Delaware combined.

In the 25 years since it was created, EM has made significant progress in this cleanup mission, completing 91 sites and significant portions of the remaining 16. Since 1989, EM has completed almost $144 billion worth of cleanup work. Sites like Fernald in Ohio and Rocky Flats in Colorado, both of which once housed large industrial complexes, are now wildlife preserves that are also available for recreational use. At the Idaho National Laboratory, we have decommissioned and demolished more than two million square feet of excess facilities, and removed all EM special nuclear material (e.g., enriched uranium) from the state. At Savannah River, we have produced over 3,700 canisters of vitrified high-level waste and closed six of the site's underground storage tanks. At our Portsmouth, Ohio and Paducah, Kentucky, sites, we have designed, constructed and now operate two facilities to convert over 60,000 cylinders of depleted uranium hexafluoride into a more stable form suitable for beneficial reuse or disposal.

Across the EM complex, our progress in footprint reduction is significant. Since EM began tracking this performance goal in 2009, we have achieved a footprint reduction of roughly 74 percent. We began tracking with approximately 931 square miles. Now, we are down to less than 300 square miles. And progress continues. These are just a few examples of our significant achievements over the past quarter century.

EM Cleanup Objectives and Priorities

EM continues to pursue its cleanup objectives guided by three overarching principles. Most importantly, EM will continue to discharge its responsibilities by conducting cleanup within a "Safety First" culture that integrates environmental, safety, and health requirements and controls into all work activities. We are proud of our safety record, which shows injury rates that are significantly lower than the averages in comparable industries; these rates continue to fall thanks to ongoing efforts to strengthen our organizational safety culture.

After safety, we are guided by a commitment to comply with our regulatory and other legal obligations, and to be good stewards of the financial resources entrusted to us. We manage these priorities within a framework of nuclear safety orders, legally binding cleanup agreements, and best business practices. We focus the majority of our resources on the materials that contain the highest concentrations of radionuclides and other hazardous materials and wastes. In addition to these priorities, EM is committed to investing in the development and deployment of sound technology as a way to reduce costs and fulfill our critical mission.

Before discussing key recent and planned accomplishments, I want to update you on the situation at the Waste Isolation Pilot Plant (WIPP) in New Mexico. As I am sure you know, we have had two recent safety events at WIPP. The first occurred February 5th when flammable residues on the surface of a salt truck came into contact with a heat source and ignited. The second, which occurred late on the night of February 14th, was a radioactive release event at WIPP, in which some contamination, primarily americium, became airborne underground. The facility is equipped with a continuous air monitor, which detected the contamination and triggered the underground ventilation system to begin filtering air before it left the underground facility. The filters are performing as designed.

To date, preliminary sampling results taken from on and around the site indicate the underground contamination event has not created any health risks for workers or the public. This includes those workers who tested positive for contamination, which was slightly above normal background levels. On April 2, we sent two successive teams into the WIPP underground to conduct preliminary investigations in a portion of the non-disposal area. As anticipated, the teams found no contamination in the immediate area. This was an important step toward additional entries into the mine to allow for further exploration. In the meantime, the event has the potential to affect other DOE sites that were preparing transuranic wastes for disposal at WIPP. We are working to assess potential impacts and make contingency plans to mitigate those impacts to the extent possible.

We take both events very seriously and are committed to identifying, acknowledging and fixing any underlying shortfalls in our policies and processes. I am proud of the way the DOE team is responding to these events. In the wake of the radioactive release event, everyone has been working together to assess the situation, develop solutions and identify the lessons that can be learned.

Key Recent and Near-Term Accomplishments

I would like to take this opportunity to highlight a number of EM's most recent accomplishments, as well as those we plan to accomplish in the remainder of FY 2014.

Cleanup activities – We continue to make significant progress in our transuranic-waste disposal program. For instance, in 2013 we shipped approximately 2,500 cubic meters of transuranic waste to WIPP from the Idaho National Laboratory's Advanced Mixed Waste Treatment Project, which has logged more than 15.1 million work hours since the last injury or illness resulting in time away from work. WIPP has now received more than 11,000 shipments and permanently disposed of more than 89,000 cubic meters of transuranic waste. At the Savannah River Site, we have produced over 3,700 canisters of vitrified high-level waste, converting it to a solid-glass form safe for long-term storage and permanent disposal. We have now completed over 45 percent of the site's high-level-waste mission, and closed two more underground storage tanks a year ahead of schedule, bringing the total number of closed tanks to six. At Moab, we have now shipped well over 6 million tons, or more than 40 percent, of the site's uranium mill tailings to the disposal site, and treated more than 200 million gallons of contaminated groundwater, preventing 795,000 pounds of ammonia and 3,950 pounds of uranium from reaching the Colorado River.

Contract and Project Management – Our cleanup progress depends in large part on a broad array of contractors, as well as the successful planning, construction and operation of large, often first-of-a-kind, projects and facilities. We continue to emphasize continuous improvement in our contract and project management by, for example, requiring more upfront planning, ensuring federal project directors and contracting officers are well trained, improving our cost-estimating capabilities, conducting more frequent project reviews, selecting proper contract types, and tying fees to final outcomes. Our efforts continue to generate significant, positive results. For instance, we negotiated a contract modification for the Salt Waste Processing Facility at the Savannah River Site that includes a cap on completion costs, provides incentives for cost savings, and gives DOE a share of any savings achieved. In a separate project at the Savannah River Site, we recently completed two additional low-level salt-waste disposal units seven months ahead of schedule and for $8 million less (about 10 percent) than the anticipated total cost of $76.5 million. We are improving our management of the Waste Treatment and Immobilization Plant (WTP) project at Hanford, including holding the contractor accountable for self-identification of issues to help ensure resolution as early as possible.

Highlights of the FY 2015 Budget Request

The FY 2015 budget request for EM is a net \$5.62 billion. The request includes the proposed reauthorization of the Uranium Enrichment Decontamination & Decommissioning Fund and the defense deposit of \$463 million. The budget request for EM is comprised of \$4.86 billion for defense environmental cleanup activities (not including the fund deposit of \$463 million), \$226 million for non-defense environmental cleanup activities, and \$531 million for Uranium Enrichment Decontamination and Decommissioning Fund cleanup activities. With the requested funding, the EM program will continue making progress in the radioactive liquid waste treatment program, approach a successful end to the legacy transuranic waste mission, and continue to make significant progress in the decontamination and demolition of the thousands of buildings and supporting infrastructure that occupy our remaining cleanup sites.

To provide just a few specific highlights, under the President's FY 2015 budget request the EM program will complete the treatment of 900,000 gallons of liquid radioactive waste at Idaho, emptying the last four of the site's aging waste storage tanks. The FY 2015 budget request supports the ongoing construction of the Waste Treatment and Immobilization Plant (WTP) to process and immobilize the Hanford tank waste in a solid glass form safe for permanent disposal. Consistent with the Department's objective to immobilize waste as soon as practicable while resolution of technical issues continues, the FY 2015 budget includes support for analysis and preliminary design of a Low Activity Waste Pretreatment System.

At Oak Ridge, we will proceed with the cleanout and demolition of the K-27 and K-31 facilities at the East Tennessee Technology Park, the last two major facilities at a site that once contained nearly 600 separate facilities, including K-25. At Hanford, we will complete cleanup of the bulk of the River Corridor's more than 500 facilities, leaving only the 324 Building, 618-10 and 618-11 Burial Grounds, and 300-296 Waste Site as the primary projects to be addressed after FY 2015. And at Paducah and Portsmouth, we will convert and package over 30,000 tons of depleted uranium, reaching 10% completion of the conversion mission. Depending on our ability to restore full operations at WIPP quickly or institute other mitigation measures, we will also achieve significant milestones in the legacy transuranic waste program, pursuing 100 percent completion at Savannah River and reaching 90 percent completion at Idaho, 88 percent completion at Oak Ridge, and 77 percent completion at Los Alamos.

<u>Budget Authority and Planned Accomplishments by Site</u>

Idaho National Laboratory, Idaho
(Dollars in Thousands)

FY 2014 Enacted	FY 2015 Request
\$391,993	\$372,103

Key Accomplishments Planned for FY 2015

- Complete the treatment of 900,000 gallons of sodium-bearing radioactive waste, the last of the radioactive liquid waste at the Idaho site
- Initiate activities to clean and close the last four of the site's radioactive liquid waste tanks
- Complete the exhumation of transuranic waste in the seventh of nine areas in the subsurface disposal area and ship the waste to the Waste Isolation Pilot Plant, achieving a completion rate equal to about 58 percent of the project's total land area
- Continue processing contact-handled transuranic (CH-TRU) waste at the Advanced Mixed Waste Treatment Project, bringing total CH-TRU prepared in FY 2015 for offsite disposal to 4,500 cubic meters
- Continue groundwater monitoring and subsurface investigations, analyzing contaminants and transport mechanisms to the Snake River Aquifer
- Continue retrieval and onsite transfer of Experimental Breeder Reactor II fuel and receipt of Domestic Research Reactor and Foreign Research Reactor Fuel

Portsmouth Gaseous Diffusion Plant, Ohio
(Dollars in Thousands)

FY 2014 Enacted	FY 2015 Request
$199,465	$221,804

Key Accomplishments Planned for FY 2015

- Continue operations of the depleted uranium hexafluoride (DUF_6) conversion facility at an optimum level of throughput, packaging the converted material for eventual beneficial reuse or disposal
- Complete the removal of contaminated process gas equipment from one of three Gaseous Diffusion Plant process buildings, as well as offsite disposal of the resulting waste
- Convert and package over 13,000 tons of depleted uranium for final disposition
- Complete sufficient design and evaluation work to allow a final regulatory decision on the proposed On-Site Waste Disposal Cell and begin construction if final approval is obtained

Paducah Gaseous Diffusion Plant, Kentucky
(Dollars in Thousands)

FY 2014 Enacted	FY 2015 Request
$324,524	$269,773

Key Accomplishments Planned for FY 2015

- Continue operations of the DUF_6 conversion facility, with an emphasis on maintaining plant availability and achieving the facility's designed conversion capacity, packaging the converted material for eventual beneficial reuse or disposal
- Complete the transition of the Paducah Gaseous Diffusion Plant to the Department of Energy from the United States Enrichment Corporation, the current leaseholder
- Complete demolition of the C-410 Complex, which contained 15 separate facilities
- If the regulators approve, initiate design activities associated with the proposed On-Site Waste Disposal Cell

Oak Ridge Site, Tennessee
(Dollars in Thousands)

FY 2014 Enacted	FY 2015 Request
$429,541	$384,975

Key Accomplishments Planned for FY 2015

- Continue shipments expected to begin later this fiscal year to Nevada of Consolidated Edison Uranium Solidification Project material from the uranium-233 inventory in Building 3019
- Reach approximately 90 percent completion in the site's transuranic waste disposition mission
- Complete the preliminary design for the Outfall 200 Mercury Treatment Facility, while continuing to develop the techniques and technologies needed to characterize and remediate mercury in the environment
- Continue design and prepare for construction of the Sludge Buildout project at the Transuranic Waste Processing Center

Savannah River Site, South Carolina
(Dollars in Thousands)

FY 2014 Enacted	FY 2015 Request
$1,255,430	$1,282,302

Key Accomplishments Planned for FY 2015

- Immobilize and dispose of 1,000,000 gallons of liquid tank waste
- Produce 120 to 130 additional canisters of vitrified high-level waste at the site's Defense Waste Processing Facility, bringing cumulative production to over 50 percent completion of the site's high-level-waste mission
- Continue packaging and shipping surplus plutonium offsite
- Continue processing aluminum-clad spent (used) nuclear fuel in H-Canyon and begin processing Canadian Highly-Enriched Uranium Liquid
- Continue to receive non-U.S. origin material from foreign countries in support of the Global Threat Reduction Initiative program
- Continue receipt of Foreign Research Reactor/Domestic Research Reactor spent (used) nuclear fuel

Richland Operations Office, Washington
(Dollars in Thousands)

FY 2014 Enacted	FY 2015 Request
$1,012,620	$914,301

Key Accomplishments Planned for FY 2015

- Complete the cleanup of the bulk of the River Corridor's more than 500 facilities, leaving Building 324, thc 618-11 Burial Ground and 300-296 Waste Site as the primary projects to be addressed after FY 2015
- Continue progress toward Plutonium Finishing Plant cleanout and demolition to slab-on-grade
- Continue to conduct, integrate and optimize site-wide groundwater and soil cleanup activities
- Continue operation of the Canister Storage Building and Waste Storage Encapsulation Facility

- Continue progress toward removal of contaminated sludge from the K West Fuel Storage Basin, including continued progress on the K West Basin Sludge Treatment Project line-item construction project
- Complete disposition of surplus facilities in the 300 Area (excluding 324 Building and ancillary buildings)

Office of River Protection, Washington
(Dollars in Thousands)

FY 2014 Enacted	FY 2015 Request
$1,210,216	$1,235,000

Key Accomplishments Planned for FY 2015

- Continue construction of the Waste Treatment and Immobilization Plant (WTP) to immobilize waste as soon as practicable while resolution of technical issues continues
- Maintain planned construction of WTP's Low Activity Waste facility, Analytical Laboratory, and Balance of Facilities, and initiate design of the infrastructure required to feed tank waste directly to the facility
- Support analysis and preliminary design of a Low Activity Waste Pretreatment System
- Complete waste retrievals in the C Tank Farm

Los Alamos National Laboratory, New Mexico
(Dollars in Thousands)

FY 2014 Enacted	FY 2015 Request
$224,789	$224,617

Key Accomplishments Planned for FY 2015

- Complete design of the hexavalent chromium pump-and-treat remedy project and begin Phase 1 operations
- Complete cleanup activities on public and Los Alamos County lands
- Obtain regulatory approval to start remedial projects in at least three on-site Material Disposal Areas (A, C and T) and complete remedial design for Material Disposal Area C
- Complete demolition of the balance of plant facilities at Technical Area 21

- Continue retrieving and processing transuranic waste from below-grade retrievable storage

Nevada National Security Site, Nevada
(Dollars in Thousands)

FY 2014 Enacted	FY 2015 Request
$61,897	$64,851

Key Accomplishments Planned for FY 2015

- Complete closure activities for 21 contaminated-soil sites
- Complete characterization activities for 6 additional contaminated-soil sites
- Support cleanup at multiple sites across the DOE complex by disposing of approximately 1,200,000 cubic feet of low-level and mixed low-level radioactive waste generated at those sites

Sandia National Laboratory, New Mexico
(Dollars in Thousands)

FY 2014 Enacted	FY 2015 Request
$2,814	$2,801

Key Accomplishments Planned for FY 2015

- Finalize and submit to the New Mexico Environment Department a Class III permit modification for regulatory closure of the Mixed Waste Landfill and transfer the landfill to long-term stewardship
- Submit updated Technical Area V Current Conceptual Model/Corrective Measures Evaluation Report to the New Mexico Environment Department
- Install up to eight new groundwater-monitoring wells at the Burn Site

Lawrence Livermore National Laboratory, California
(Dollars in Thousands)

FY 2014 Enacted	FY 2015 Request
$1,476	$1,366

Key Accomplishments Planned for FY 2015

- Complete the site-specific, baseline human-health risk assessment
- Complete groundwater-contamination fate-and-transport modeling
- Develop risk-based uranium cleanup standards for the Building 812 Operable Unit
- Evaluate available soil-remediation treatment technologies and develop remedial alternatives

West Valley Demonstration Project, New York
(Dollars in Thousands)

FY 2014 Enacted	FY 2015 Request
$66,015	$60,457

Key Accomplishments Planned for FY 2015

- Complete the relocation of high-level waste canisters to a new, on-site storage facility
- Complete deactivation of the Main Plant Process Building's labs, sample cells, extraction cells, and crane room
- Complete demolition of Lag Storage Area 3 and debris removal

Moab, Utah
(Dollars in Thousands)

FY 2014 Enacted	FY 2015 Request
$38,000	$35,837

Key Accomplishments Planned for FY 2015

- Continue excavating tailings – approximately 875,000 tons in FY 2015 – and transport them to the disposal cell

- Operate interim remedial action for contaminated groundwater, extracting a projected 12 million gallons and diverting and injecting approximately 8 million gallons

ETEC, California
(Dollars in Thousands)

FY 2014 Enacted	FY 2015 Request
$9,404	$8,959

Key Accomplishments Planned for FY 2015

- Complete the Resource Conservation and Recovery Act Facility Investigation groundwater characterization program
- Submit to the state regulators the Final Remedial Investigation Plan, site conceptual groundwater model report, Soils Remedial Action Implementation Plan, and a complete Draft Environmental Impact Statement
- Begin work on Final Environmental Impact Statement and Record of Decision

Carlsbad Field Office, New Mexico
(Dollars in Thousands)

FY 2014 Enacted	FY 2015 Request
$221,170	$220,475

Key Accomplishments Planned for FY 2015 *(assuming timely restoration of normal operations)*

- Support transport and disposal of remote-handled and contact-handled TRU waste at the Waste Isolation Pilot Plant
- Continue Central Characterization Project for TRU waste at Los Alamos National Laboratory, Idaho National Laboratory, Oak Ridge National Laboratory, and Savannah River
- Maintain capability for receipt and disposal for up to 26 shipments per week of contact-handled and remote-handled TRU for 41 weeks

Conclusion

Mr. Chairman, Ranking Member Kaptur, and Members of the Subcommittee, I am honored to be here today representing the Office of Environmental Management. EM is committed to achieving our mission and will continue to apply innovative environmental cleanup strategies to complete work safely, on schedule, and within cost, thereby demonstrating value to the American taxpayers. Our FY 2015 request allows us to capitalize on our past investments and successes. We will make progress in the high-level-waste treatment mission, complete the cleanout and demolition of several major facilities across the complex, approach the end of our legacy transuranic waste disposition mission, and continue the significant progress we have made in the management of nuclear materials and remediation of contaminated soil and groundwater. I am pleased to answer any questions you may have.

Mr. SIMPSON. Thank you. And I appreciate you being here today, and I appreciate the work you have done at the department in EM. You have done some great things. You are right; we have cleaned up a lot of sites. I jokingly, or half-jokingly, told them when I was down at Rocky Flats that we did not really clean up Rocky Flats, we just shipped it to Idaho. But, I mean, that is what we do, and we are doing the work there to get it to its——

Mr. HUIZENGA. At the time it made sense.

Mr. SIMPSON. That is right. And it still does. It is a great job to see Rocky Flats now versus what it was some time ago, and those are expensive and long-term projects to get those done.

Let us talk a little bit about WIPP. Can you give us an update on where we are on that? Any indication yet of what happened? Any indication of how long it might be closed down, and more specifically, for this Committee, any indication on what it is going to cost us? Because I suspect there is going to be an additional cost that is going to come to this Committee that is not reflected in the current budget because obviously this happened after the budget submission. What is the outlook for that? And also in that question, what will the impact be on state agreements that we have with a variety of states?

Mr. HUIZENGA. Well, in terms of the status, you know, we have been down in the mine twice. We went down the air intake shaft and down the salt shaft, and we have established in a sense a clean zone in the mine. If you can kind of imagine, the contamination event happened over where the waste was being emplaced, or at least we believe that is where it was likely to happen. And the ventilation pulled the air through a specific drift, up the exhaust shaft, through the HEPA ventilation filters. So there are other areas where we had hoped would be uncontaminated, and indeed, we have gotten down into those areas and they are uncontaminated. There are other doors and ventilation ducts and systems that could have vented that contaminated air up the shaft. So there will be some part of it that is probably contaminated, but so far we have been able to enter places that are not contaminated. We are going in now, probably in the next week or two, go down and proceed to the waste face and try to actually understand what happened. Until we really get there, we are not going to know for sure how long it is going to take us to recover from the incident. So I do not have a good answer for you right now, but in the next week or two, we should actually be able to go down, understand what happened. We are already drawing up contingency plans, such that if we see that there was some partial roof collapse or something happened to puncture one of the drums, we will be able to understand what to do with that. We are working with the Idaho National Laboratory, as a matter of fact, to look at decontamination activities and possible techniques that we can use to either put shotcrete on the walls to fix any contamination that might be there or some other ways to clean it up. So we are progressing in a safe and responsible manner to basically understand what the problem is.

What that might do to overall regulatory commitments that we have in the state of Idaho or the state of Tennessee and other places, I do not know exactly again because we do not know the cause. We do not know exactly how difficult it is going to be to recover, but I do know that in Idaho, we have been working with the contractor and with the federal managers there. They are continuing to package transuranic waste right now. They have several months' worth of storage capability onsite. Should we find ourselves in a situation where they are going to run short on space, we hope to be able to make the case to the regulators to allow us some additional permitted space to continue to store at Idaho. I have been working with the leadership down there in Tennessee. They are continuing to package contact-handled waste. It is likely to have some impact on our ability to package the remote-handled waste, and that is because the contact-handled waste, you know, we can package it up and we can store it onsite. The remote handled waste, generally, we like to package that up and send it to WIPP as soon as possible. So we are looking at the possibility of juggling the schedule there a little bit. We will have to work with the regulator. But again, all of this will be clear in the next week or two when we get down to the waste phase and understand what the real situation is.

Mr. SIMPSON. So we do not know yet or have any idea yet about what the potential cost is—bigger than a bread box, smaller than a space shuttle, somewhere in there?

Mr. HUIZENGA. It is going to be bigger than a bread box.

Mr. SIMPSON. Will you have to submit anything—because, I mean, we are in a stage here where we are going to probably be marking up our bill in a month, month and a half, something like that, six weeks or so from now. Do you think you will have some estimates on what the cost is? Or will you have to submit a reprogramming request to the Committee? If so, how will that reprogramming request, if it is for however much, affect the other programs at the other sites?

Mr. HUIZENGA. Because we expect to get down there in the next couple weeks, I would think that we should be able to start to formulate an estimate of what it will cost. It is going to take some time, but within this time period and while you are marking up, we should be able to get back to you.

Mr. SIMPSON. Well, I would encourage you, and I know you are very good at this, so it probably does not need the encouragement, but keep the Committee informed and the staff informed when you get down there and find out what the challenges are that we face and what we might have to do and what the potential costs might be so that we can address it together.

Mr. HUIZENGA. Sure.

Mr. SIMPSON. I appreciate that.

Mr. HUIZENGA. Absolutely.

Mr. SIMPSON. Marcy.

Ms. KAPTUR. Thank you, Mr. Chairman.

Mr. Huizenga, I wanted to ask you first if you could explain in terms the American people can understand the nature of the cleanup that has already been done. I need the big frame. The nature of the cleanup that has already been done since the program started, I think, in 1989, 107 sites down to 16 sites now. But I am interested in the volume of material in key categories that has been transferred and properly stored or disposed of and what remains to be done. There are some that say that the worst of the cleanup remains ahead of us, not behind us. And my second question really is after talking about the transuranic material and other major categories of material that are necessary to move and accommodate, I am interested in a time horizon. At your current level of funding, how long would it take us to, by your best guestimate, deal with the remaining cleanup sites, the 16 sites that you have outlined. Your testimony, essentially, and the backup material I have goes by site but it really does not group it by material. You do give the miles, the square miles figure, reducing—in your testimony today I think you said—oh, and I have to go back here—931 square miles down to 300 square miles, but there could be a lot of material on those 300 square miles. And so I am wondering if you could put it in more of a summary context for those who are listening and for the record, please.

Mr. HUIZENGA. Okay. I will give it a whirl. It is 25 years' worth of a lot of stuff. But, I mean, I can tell you that we started, for instance, with the Rocky Flats material and other materials that were at Idaho and Tennessee and other—Savannah River. We started packaging up the plutonium and the uranium early on to make sure that it could be stored safely.

Ms. KAPTUR. So those were the two top categories first?

Mr. HUIZENGA. Those are the two top categories, and those, that plutonium and uranium, is 100 percent safely stored now. So it is packaged up in stainless steel containers and safely stored. So we completed that.

Ms. KAPTUR. And can you state for the record the volume? If you do not have it, supply it.

Mr. HUIZENGA. Yeah. There are 5,089 containers, but I will have to get for the record what volume that would actually be in. Of the uranium, there are 107,000 kilograms of bulk material.

So that was one important—from a safety standpoint, we needed to take care of that early on, and that is taken care of. Now, we are in the process of packaging up transuranic waste. From a transuranic waste standpoint, from the contact, there's contact-handled and remote-handled. From a contact-handled standpoint, we are roughly 60-ish percent through packaging up the legacy contact-handled transuranic waste.

Ms. KAPTUR. Is that on several sites?

Mr. HUIZENGA. That is across the complex. Yeah. Some sites are farther along than others. The Savannah River site, we hope to complete the legacy material later on this fiscal year or in Fiscal Year 2015, and the chairman's home state will be packaging transuranic contact-handled waste up I think somewhere in the 2018 timeframe with the legacy contact-handled waste. And I will have to check, Congressman Fleischmann, on the exact schedule for Tennessee. But we are in this, you know, we are closing in on the contact-handled. The remote-handled is a little bit further behind. The remote-handled, as a matter of fact, we are probably only on the order of 10 percent complete. So from that standpoint of the category, the transuranic waste is 50 to 60 percent to 10 percent depending on the type of waste. For the high-level waste, the liquid waste, for instance, that we are working on at Hanford, the 56 million gallons of high-level waste, we are working on a new phased strategy to bring that facility online. I can talk a little bit more about that. So we have not actually solidified any of those 56 million gallons. At West Valley, we solidified all of the high-level waste. And at Savannah River, we have solidified almost 50 percent of the high-level waste.

Ms. KAPTUR. Are those the only two places you have it?

Mr. HUIZENGA. There are four places where we have liquid high-level waste. West Valley is done. Savannah River is roughly half done. Idaho, we are going to finish the 900,000 gallons of liquid waste later on this year or in early fiscal 2015, and Hanford would be in a sense the long pole in the tent, and we will be working on that for probably the next 40 or more years.

In that respect, from timing you asked to overall schedules, it varies. In Tennessee, we are about done cleaning up the gaseous diffusion plants. We will be done in the 2020 timeframe, I think, someplace in that ballpark. And in Portsmouth, your home state, we are not as far along because we got that facility back from USEC later than we got the facilities in Tennessee. And in Paducah, in Kentucky, you know, we are about to transfer the Paducah gaseous diffusion plant back to the Department of Energy later on this year or early in Fiscal Year 2015. So we really have been making some progress on groundwater cleanup and soil contamination cleanup at Paducah, but we have not really started our D&D activity. And that is likely to take several years, maybe a decade or more to actually complete those activities at Portsmouth and Paducah.

Ms. KAPTUR. So plutonium, uranium, transuranic high-level waste. Any other categories?

Mr. HUIZENGA. Low-level waste is another category. So we dispose of low-level waste. Oftentimes, we dispose of that onsite, and sometimes we ship that to our site in Nevada. And we are on the order of 75 percent or so completed with a disposition of our low level waste.

Ms. KAPTUR. I think that it would be very helpful, and I am sure you have the material, I just do not have it, if you could supply that information to the record.

Mr. HUIZENGA. I certainly could.

Ms. KAPTUR. Okay. And we will proceed. I will let Mr. Fleischmann speak and then I have another question.

Mr. SIMPSON. Mr. Fleischmann.

Mr. FLEISCHMANN. Thank you, Mr. Chairman, and Mr. Huizenga, thank you for being here with us today.

Let me say this to begin. Thank you. Dave, you took over at a tough time. This is a very difficult job. You have been exceedingly hands-on at Oak Ridge. Our community appreciates this. I appreciate this. Mr. Whitney, the gentleman on the ground there who works with you, is always very responsive. And as you know, we have decades' worth of work to do at Oak Ridge, and I am committed, I am passionate about getting environmental cleanup of our legacy waste done. So I thank you.

You alluded to, Dave, in your opening remarks about the K25 plant. In December, we gathered to see what was, at one time, the largest building in the world, the K25 plant, where thousands of folks came and won World War II, won the Cold War, and we saw that building come down. That was a historic occasion, and it was very meaningful for us.

I have some questions following up. UCORP is well on its way to removing the highly contaminated buildings so that the site can be turned into productive use. I have been briefed by the contractor—I am sorry, UCORP is the contractor—I am briefed by them that the closure of the cleanup site is within reach.

My first question though is why did the budget request cut funding at a time when so much progress is being made, sir?

Mr. HUIZENGA. Well, in a sense we did make the progress on K25 and that allowed us to produce the funding. You know, we are going to turn our attention now to K31 and K27, but we have also worked with the contractor and recognize that we can make a smooth transition of the workers from K25 into K31 and ultimately onto the bigger facility, K27, perhaps later on in 2015 or early in 2016. And so we are trying to actually work on a long-term smooth opportunity to transition workers from one facility to the other.

Mr. FLEISCHMANN. Sir, does it not make sense though to fund the D&D work at the prior year level and have a major site completed? Will this not save money in the long run by reducing the overhead costs? Clearly, if you short fund it and it takes longer to get done, ultimately, the project is going to cost more. I would like you to respond to that, please.

Mr. HUIZENGA. You are right. Absolutely, we could reduce our life cycle costs if we had some additional funding, but we are trying to—we have got regulatory commitments and agreements across the complex, and with the resources that we have, we are trying to make an equitable distribution to make sure that we are making steady progress at all the sites.

Mr. FLEISCHMANN. Okay. My distinguished colleague, the ranking member, had asked about plutonium and uranium. I would like to talk about a very serious problem at Oak Ridge—mercury. Mercury is a very serious problem. By some estimates, as a legacy waste, there may be as much as two million pounds of unaccounted for mercury at Y12. And this is a major cleanup mission. That obviously is one of the areas if we could get additional funds for ETTP and get that cleaned up, we could move into long-term mercury cleanup at Y12. Could you please give the Committee some background on this project and explain the timetable for this project, please?

Mr. HUIZENGA. For the work that we are going to do on mercury?

Mr. FLEISCHMANN. Yes, sir.

Mr. HUIZENGA. Sure. You know, we had an opportunity one of the times when I visited the site to announce the development of the 200 area outfall of the mercury treatment facility. In a sense, what we are trying to do is before we start major cleanup activities at the Y12 facility where the mercury contamination exists, we want to make sure that if we disturb the groundwater or the soil in that area, that we are able to capture any mercury should it get into the environment. So this outfall is in a sense a trap that will be put in place at a specific collection point so that the water that would flow down gradient would ultimately be trapped in here and treated. The mercury would be captured in the treatment facility and properly disposed of. So we are in a sense laying the ground-work for the long-term cleanup mission that you indicate is so important to you and to us.

Mr. FLEISCHMANN. Thank you, sir.

I need to talk about building 3019. Again, for the Committee's benefit, we have legacy sites across the entire campus at Oak Ridge. And this is particularly frustrating because 3019 Building is at ORNL. It's been frustrating, Mr. Huizenga, to have a clear path forward on Building 3019 at ORNL and then see those plans disintegrate. Where does the Department stand in negotiations with Nevada?

Mr. HUIZENGA. We are continuing our discussions with the governor and his representatives. I think we are making steady progress. We recently had a group of folks from Nevada go up to a transportation tabletop simulated exercise in the State of Colorado so we are working with them to help them understand that we do know how to transport materials; we have been transporting these materials safely for decades and, you know, we would intend to transport this material in a similarly safe fashion. So there are a number of things that they have asked for to have them become more comfortable with our proposal and we are working through one by one each one of these activities. And we are going to have, you know, continued discussion with them so that we can hopefully reach resolution and start shipping, you know, later this year.

Mr. FLEISCHMANN. Okay. So we are looking at later this year as the time frame for beginning the shipments?

Mr. HUIZENGA. That is certainly our desire.

Mr. FLEISCHMANN. Good. Thank you. Mr. Chairman, I will yield back. Thank you.

Mr. SIMPSON. Fortenberry.

Mr. FORTENBERRY. Thank you, Mr. Chairman. Good morning, sir.

Mr. HUIZENGA. Morning.

Mr. FORTENBERRY. A question for you that I have is not just in regard to what we have defined as clean up admission for your agency, but what about what we don't know? Can you give an estimate of what might be out there that is potentially harmful, environmentally impactful but is not yet identified?

Mr. HUIZENGA. We got 25 years focus on this and to be honest with you I—of course I don't know what I don't know but I do know that——

Mr. FORTENBERRY. But you know more than I do.

Mr. HUIZENGA. And in that regard we have done extensive characterization at all of our sites so we know what is in the groundwater and we know that we got pump and treat systems in place at some facilities, many facilities to actually capture and suck these contaminated waters up and treat them and inject, you know, clean water back into the system. As I mentioned to Ranking Member Kaptur that we have packaged up our plutonium and our uranium; it is safely stored so we know that it can be stored safely for, you know, we put it in 50 year storage containers. We have a pretty good sense of how to actually solidify the glass waste at our Savannah River Plant and are making steady progress there. We just issued a test plan last week and what we hope to do from scope and schedule to solve the remaining technical problems on the Hanford Vitrification Plant. So we are starting to bring some focus and hopefully some closure to solving the mixing issues that have been plaguing us up there for the last couple of years. So I think we have the environment pretty well characterized, the material pretty safely stored that we knew, you know, might cause issues. And at this point the mercury issue that Congressman Fleischmann was talking about, there still is research and development that needs to be done to ultimately understand how to better treat and deal with mercury. So there's the technology development area there that we are going to have to spend some time and effort on.

Mr. FORTENBERRY. So, by and large, in terms of the respect from a potential problem across the country, they are identified, there is a fairly clear understanding of the inventory of hazardous material that would fall under your purview and mitigation steps under way? Is that a fair assumption?

Mr. HUIZENGA. Yes, sir. That's absolutely right. And one of the things that Congressman Fleischmann was pointing out is that, you know, there are several large facilities at the Y12 Plant in Tennessee that we haven't actually taken over yet. So when we start taking those facilities apart we might learn new things about the mercury and how much mercury there is and on where it is. So there might be, you know, some issues that need to be dealt with in that regard.

Mr. FORTENBERRY. All right. So no surprises lingering out there?

Mr. HUIZENGA. There will be some surprises I am sure, sir.

Mr. FORTENBERRY. All right. Thank you.

Mr. SIMPSON. There are always surprises in this business. Have we pretty much completed or how far do we have to go? The issue is transferring facilities that need to be D&D'd to EM—as in Idaho, the lab operations were taking care of some of those functions and we have been trying to transfer those facilities over to EM. So do we know across the country the scope of what EM is going to be responsible for, or is that still an expanding universe?

Mr. HUIZENGA. We have someplace north of 5,000 facilities, you know, in our inventory and I forget exactly how many we are done with but, you know, probably in order of 3,000 of them and there are more. So the Y12 facilities—actually NNSA still is responsible for those. There are as mentioned, there are facilities in Idaho that the nuclear energy folks are responsible for. I mean it is a little hard to say how many more there are because for instance we were working just recently with senior leadership with Assistant Secretary Lyons to talk about the facilities in Idaho. Some he wants to keep, some he wants to actually take back from EM——

Mr. SIMPSON. Right.

Mr. HUIZENGA [continuing]. And some he wants to give to us. So there has been a give and take. So we know that there will be some back and forth at some sites and some sites the NNSA clearly is and will be in a position over the next few years to try to transfer those facilities to EM.

Mr. SIMPSON. Okay. The final fiscal year 2014 budget provided an additional $208 million above the budget request for environmental cleanup activities. What has the extra funding been used to accomplish? And several sites have reported the DOE has been holding back fiscal year 2014 funds. Are you holding back any of these funds and if so where and why?

Mr. HUIZENGA. We are not intentionally holding back funds that could actually be usefully spent——

Mr. SIMPSON. Are you unintentionally?

Mr. HUIZENGA. No. No, we are not doing that either. No, I am just trying to be truthful in that regard. Some sites are going to be able to—even in Idaho for instance where you gave us I think an additional 20 million or so and that was extremely appreciated, that we need to carryover a certain amount of money into the '15 to be able to, you know, to keep going at the start of the fiscal year. So we are planning on carrying over about the same amount next year as we did the last couple of years. So there will be some of those funds that are kind of in a normal carry over mode, but we are not trying to, you know, withhold any of the additional funding that you appropriated to get work done in this particular year.

Mr. SIMPSON. Could you say what has been accomplished with those additional funds?

Mr. HUIZENGA. I can if I can find it in this pile of paper here. You mean the specific—across the——

Mr. SIMPSON. Across the complex.

Mr. HUIZENGA. Across the complex?

Mr. SIMPSON. Just generally.

Mr. HUIZENGA. Well, I know that at LANL for instance we are using some of the funding to help us with getting the 3706 cubic meters off the mesa, there was additional money at Richland and we are using that to help clean up along the Columbia River. There was work at Savannah River site. We are actually working on additional progress on the federal facilities cleanup activities there and there is a Facilities Agreement. At Portsmouth you know we are going to actually continue to decommission and cut and cap one of the major facilities. We are taking the compressors and the large equipment out and packaging it up and sending some of that to the State of Nevada for disposal. So we are using some of the additional funds for that as well. I think those are the major areas that account for the, you know, additional work that we are being able to do as a result of the plus out.

Mr. SIMPSON. Let me talk to you for a few minutes about Hanford. The Department issued a draft Hanford Tank Waste Retrieval Treatment and Disposal Framework which describes a path forward for meeting Hanford's tank waste mission. You recently met with the State of Washington to discuss this framework but the State said it would need considerably more detail. The Department and the State of Washington have each put forward new proposals to modify the 2010 Consent Decree that governs the cleanup of the Hanford tank waste. What are the main differences between the Department's proposal and the State of Washington's proposal?

Mr. HUIZENGA. Well if you don't mind if I would start with the main similarity which I think is extremely important.

Mr. SIMPSON. Okay.

Mr. HUIZENGA. We both believe that it makes sense to start up the large facility in a phased manner and by that I mean the original baseline that we had signed up to in 2010 in the Consent Decree was to start the entire facility up at one time, five major facilities starting up at one time. We now believe it makes sense to phase the startup. So we will start up the Low Activity Waste facility first because we don't really have any technical issues associated with that facility. The more complicated Pretreatment Facility and High Level Waste facility would be started up later in the phased nature of the proposal. So the State and DOE both agree it makes sense to start on the Low Activity Waste first and then start up the Pretreatment and High Level Waste facility. So in that regard there is a similarity.

The State is focused on, you know, when we are going to start up the Pretreatment Facility and we also want to know when but we wanted to make a prediction and a commitment to starting up that facility when we have solved the technical problems. We think in the past we didn't clearly enough understand the technical complexities of mixing this complicated high level waste. And because we ran into some issues with making sure we could mix that waste safely and ensure that the facility was going to work over the 40 years design lifetime of the plant we had to take a step back. And now we are going to actually take a new approach, perhaps standardize some of the vessels in this complicated facility, some of the ones that haven't been installed already, and make them smaller. And standardization we can actually test that vessel to make sure that the mixing will take place effectively in the vessel and that way we can put the complicated mixing issues behind us once and for all. That is our intention right now.

The State also agrees that that is, you know, important for us to do that; to make sure that we understand the technical issues and work through them in a methodical manner. So we are working closely with the Governor and, you know, we are hoping to reach some, you know, compromise perhaps between their view of how this should be done and ours. But fundamentally we agree on the strategy.

Mr. SIMPSON. One of the questions that has come up is the fact that we have discovered new leaking tanks that are out there. I understand that there is a debate about whether to build new tanks; that the State may want us to put new tanks in. The Department is not necessarily in favor of that, as I understand, and there is concern by some members that if you do that then it is going to cost a lot of money and it is going to slow down actual cleanup process at Hanford. What is your view on that?

Mr. HUIZENGA. Our view is that we should stay focused on the mission at hand. That being said part of our proposal does include building some new tanks; it's called the tank waste characterization and staging facility. These tanks would be useful to actually mix the waste before it is sent into the Pretreatment Facility. So there is some additional tank capability in our proposal as well and we think that the waste that is currently stored in the double shell tanks can be safely stored for the foreseeable future. We have an active monitoring program in place so we, you know, we put cameras down in the tanks in the annulus between the inner and the outer liner. We are watching. We do have one tank that has some, you know, limited seeping in this annulus but we are keeping a close on that and we believe that the best approach is to keep monitoring it and stay focused with our long term approach of making glass.

Mr. SIMPSON. Assuming I live to the average lifespan of the American male will I ever see any glass manufactured there?

Mr. HUIZENGA. I certainly hope so because I am not very far behind you and I plan on seeing some glass.

Mr. SIMPSON. Appreciate it. Marcy.

Ms. KAPTUR. Thank you, Mr. Chairman. I wanted to go back to my first round of questioning, Mr. Huizenga. On that little chart you have there I see blue and I see green. We don't have that in our materials.

Mr. HUIZENGA. You should, and I can get this to you.

Ms. KAPTUR. All right. I don't have it in mine.

Mr. HUIZENGA. I am sorry.

Ms. KAPTUR. Maybe they just didn't put it in here, I don't know. Or maybe I haven't found it.

Mr. HUIZENGA. No, I might not have given it. I'll make sure you get a copy.

Ms. KAPTUR. Okay. Explain what is on that chart.

Mr. HUIZENGA. Explain what it is?

Ms. KAPTUR. Yes.

Mr. HUIZENGA. This lists these different categories of material that you were talking about. It is the plutonium oxide, plutonium and uranium.

Ms. KAPTUR. By volume?

Mr. HUIZENGA. Yes, by volume. By containers or by kilograms.

Ms. KAPTUR. So that is really the target? This is where we have——

Mr. HUIZENGA. This is my scorecard.

Ms. KAPTUR. Okay.

Mr. HUIZENGA. I am going to give this to you.

Ms. KAPTUR. And what is it telling us?

Mr. HUIZENGA. It is telling us as I indicated we are making pretty steady progress in some areas. So in packaging up, safely storing this material, the low level waste, the contact handled waste. This is kind of, you know, more than half done. But there is also more work to be done on the high level waste at Hanford as we know. And you actually alluded to this year and last year, yes we completed 91 sites and we have got 16 to go but there is some tough stuff left to do at the 16 so that is why there is still some work to be done here on the high level waste side.

Ms. KAPTUR. What happens with contaminated groundwater?

Mr. HUIZENGA. The contaminated groundwater is for the most part being either pumped and treated like a big 200 West Pump and Treat facility on the Hanford plateau where in a sense we encircle the ground water plume and put extraction wells out to suck up the contaminates and then to clean the water and re-inject the water basically down into to drive stuff into the extraction well. So we have a process that is in a sense containing the ground water plumes. In Savannah River I know they have found ways to actually do this with passive systems, a way to not actually have to use the groundwater treatment all the time. But they have put in some french drains and different drainage systems to be able to actually shunt the water over into collection pits or collection areas or treatment facilities.

Ms. KAPTUR. As you look forward, and interpreting from your chart there, how much of the cleanup of these sites still remains before us? As you look at the magnitude of this, you must be one of the few persons in the world that would even understand this. How much more do we have to do?

Mr. HUIZENGA. Well, in terms of years or dollars or kilograms?

Ms. KAPTUR. All.

Mr. HUIZENGA. Okay.

Ms. KAPTUR. All of the above.

Mr. HUIZENGA. Well, at Hanford we are building and have yet to start a facility that we are designing to run for 40 years. And it will have to run for 40 years in order to get the job done. In Idaho we are making steady progress on advanced mix waste treatment facility. You know, they will complete their work well before that.

Ms. KAPTUR. But we are not concerned about uranium and plutonium at Hanford.

Mr. HUIZENGA. Well, we have spent fuel, uranium, plutonium stored safely in the canister storage building. There is a uranium plume that we are going to treat with a pump and treat system so——

Ms. KAPTUR. So when you said in your earlier testimony that the uranium and plutonium are pretty much put to bed, but not at Hanford?

Mr. HUIZENGA. Well, the uranium that could be packaged is packaged and safely stored. The plutonium is safely stored. There is some uranium in the groundwater and that needs to be dealt with. So there are some things of nuclear materials that can be packaged up, but if some of these contaminants have gotten into the soil——

Ms. KAPTUR. Well, the greater clarity you could provide on the materials that need to be cleaned up that would be very valuable I think for us to understand more clearly and where that needs to be cleaned up so we can make a judgment as to whether it is true that over half of this has been cleaned up or whether it hasn't.

Mr. HUIZENGA. Sure.

Ms. KAPTUR. And it lacks a little clarity at this point. I don't know, maybe others would disagree with me. But then it also permits us to think about the future and budgeting for what might be necessary. The figures look kind of rosy, the square mile figures look really rosy. Then when you get down into it you go from, you know, you have got 16 sites left.

Mr. HUIZENGA. Yeah, I don't want to misrepresent the fact that those 16 sites are the easy ones. There are some challenges.

Ms. KAPTUR. Quite more involved.

Mr. HUIZENGA. Yes.

Ms. KAPTUR. And that is what I am trying to understand, the magnitude of what is left.

Mr. HUIZENGA. They are telling me something I already know but. We have on the order we think, over $200 billion in to go costs. If we look at each one of our sites and factor in how much it will cost to actually to completely D&D, the Portsmouth facility and that Paducah facility which we haven't even really taken over yet, wrap things up in Tennessee, do our work in Idaho, at Hanford, Savannah River, and in Tennessee, so these are the big sites. Then there is probably over $200 billion of work to be done.

Ms. KAPTUR. Okay. Can you give us an update on what you are doing and your progress on ensuring workers can raise safety issues without fear of retribution? For example in the wake of the termination of Donna Busche as a nuclear safety manager at Hanford, the Department has ordered the inspector General to look into these allegations. Do you know if the Department plans to release the results of that investigation?

Mr. HUIZENGA. I honestly don't know the answer to that. I can check. But I do know that a serious investigation that is ongoing, you know—I hope that we can convince you and others that the Department does not tolerate retaliation. We have had this discussion with our contractors at the Hanford site at the most senior levels, with the contractor community and they know and they understand their contractual obligations and commitments to us to provide a work environment where people can raise issues without fear of retaliation.

Ms. KAPTUR. And how will the Department actually make—if in fact when the Inspector General completes the report and there is a report what is the process inside of DOE to release it or not to release it? Do you know what the process is?

Mr. HUIZENGA. I honestly don't know what the process would be to deal with the findings. I don't know whether they would be confidential in nature or not, but I can check on that and I will definitely get back to you.

Ms. KAPTUR. We would greatly appreciate that for the record. I wanted to just turn again to Portsmouth. As I look at the funding request though the administration has increased funding it appears that the funding is expected to go down actually at that site because DOE does not plan to generate as much cleanup funding as last year from its Uranium Transfer Agreements. Could you comment on the funding that you expect to generate from uranium transfers at that site and how does that compare to the amount generated in 2014?

Mr. HUIZENGA. Yeah, we hope to be able to barter a similar amount of, somewhere over 2,000 kilograms. But you are right, the price is now a function of the market and the prices for uranium have indeed gone down. So we won't know exactly what the prices are going to be. We will continue to monitor that and, you know, to the extent that the prices go down we will perhaps try to barter a little more. We have a limit on what we are allowed to barter within the Secretarial determination because we want to make sure that we are sensitive overall to the market impacts. But we have the ability to make some adjustments if needed.

Ms. KAPTUR. All right. And could you explain at the Portsmouth facility it appears there is a 33 percent cut in security funding from $12.5 million to $8.5 million for this next fiscal year and actually we have had a transition as you know from security at USEC to the Department of Energy itself. Do you know why there would be such a steep reduction in funding for safety and security?

Mr. HUIZENGA. I do know we are working closely with the contractor. The request for safeguards and security is similar actually to our '14 request. So you are able to give us a little bit more in the '14 appropriate than we actually had initially requested. So our '15 request is similar to our '14 request and we are taking advantage of the additional funding to beef up some of the security issues. But in the long run we think we are going to be fine with our '15 request level. We are actually looking at maybe adjusting some of the fence lines and the guard posts if possible. And although we haven't made final decisions on ways to actually make that less expensive if possible but still secure.

Ms. KAPTUR. Thank you for that clarification. My last question will be a homework assignment and that is if you would kindly prepare an addendum to your testimony that could explain to the American people in language they can understand what we have accomplished in terms of cleanup and what lies ahead with all the factors we discussed, the square miles, the actual volume of which material. Mr. Fleischmann mentioned mercury. I don't know if mercury is on your list but if you could kindly give us a greater clarity. Not 100 pages of reply, 3 at the most.

Mr. HUIZENGA. Okay. That is a challenge.

Ms. KAPTUR. Then I think we would better be able to—you mentioned $200 billion looking down the road over what period of time. I think that big picture summary would be very valuable to the community.

Mr. HUIZENGA. We have, in that regard, had some other discussion with folks about this, we have binned the $200 billion to go costs into various bins so we do already have a sense of about 60 percent of that money would be spent on finishing the high level waste, making glass logs out of the liquids, and the associated D&D work that would be done at Portsmouth and Paducah and wrapping up the major decommissioning work at Tennessee. So we have some granularity on that already and so I will make sure that we include that into the record.

Ms. KAPTUR. And give yourself credit and all those associated with you and all contractors for what has been accomplished. I think has got to be made a little more clear as well.

Mr. HUIZENGA. Excellent.

Ms. KAPTUR. Thank you. Thank you very much. That ends my questioning.

Mr. NUNNELEE. The Chairman stepped out, so let me drive the train. So I get to recognize myself. Mr. Huizenga, the Department submitted a request for interest for use of DOE facilities and stockpiles of depleted uranium to support new emissions at Paducah. Last fall you announced you had selected a reuse proposal submitted by GE Hitachi. So under what general terms would GE Hitachi reinvest in Paducah and can you give me an outline for how this arrangement is going to function?

Mr. HUIZENGA. Well, sir, we are in the process of negotiating the contracting details with GLE right now. As you noted we did enter into these discussions I think just shortly before Thanksgiving of last year and we are now currently discussing things with state and local government relative to ultimately where the facility will be placed, what land will be placed. Probably next to the actual DOE site and there are some land use issues that we are working through in that regard right now to make sure that the proper use of the—the land is set aside for use in some manner and we want to make sure it is well preserved or we swap some land that maybe if we take that land we use some other land for preservation. So those discussions are ongoing right now.

Mr. NUNNELEE. All right. So based on all that, in what time-frame could a laser enrichment facility become operational in Paducah?

Mr. HUIZENGA. I will have to get back to you for the exact date of when—when the facility will actually be up and running? Is that what you are——

Mr. NUNNELEE. Yeah.

Mr. HUIZENGA [continuing]. Trying to clarify? I don't have that date in my head.

Mr. NUNNELEE. If you could get us that.

Mr. HUIZENGA. Yes.

Mr. NUNNELEE. All right. So if this doesn't go through right away, will you begin the decontamination work or where will that leave you?

Mr. HUIZENGA. At Paducah in general?

Mr. NUNNELEE. Yes.

Mr. HUIZENGA. Well, we hope to do these things in parallel.

Mr. NUNNELEE. Okay.

Mr. HUIZENGA. So let us be clear. We have got three things going on, or ultimately we will have three things going on parallel. We will start the surveillance and maintenance of the facilities once we take them over which will ultimately lead to the D&D of those major facilities. We will be pursuing this work with GLE so that we can take some of the TALEs and re-enrich them, and we will continue probably with the very low assay TALEs that are not of interests to GLE. We will continue to process those through the DUF6 conversion plant which is up and running on site both there and at Portsmouth. So we will have the three parallel activities going on. GLE will ultimately need to license this facility with the NRC and I don't suspect that there will be problems with that but that will take some time and that will have to be factored into when the facility will ultimately be up and running.

Mr. NUNNELEE. Miss Kaptur.

Ms. KAPTUR. My question is complete.

Mr. NUNNELEE. Do we have anybody else? Let me check on the Chair. Oh, there we go.

Mr. SIMPSON. We are back. Who is next? Marcy, do you have anything else you would like to ask?

Mr. HUIZENGA. She gave me a homework assignment, Mr. Chairman.

Mr. SIMPSON. I want to make him sweat somehow.

Mr. HUIZENGA. You do this every year, sir.

Mr. SIMPSON. Okay. Back to WIPP. In 2014 the omnibus provided additional funding above the request specifically to address deferred maintenance at WIPP yet your budget justification states you plan to spend only $10 million total on maintenance in 2014, $2 million less than last year's plans despite having those additional funds. The accident investigation of the salt truck fire concluded that failure to conduct adequate periodic maintenance on the truck was the root cause of the fire. The Department has still not completed all corrective actions it said it would in response to a letter sent by the Defense Nuclear Facilities Safety Board back in 2012 identifying poor maintenance practices at WIPP. What are your plans to address the maintenance problems in the site and do you think there are needs for a greater emphasis on improving maintenance at the site?

Mr. HUIZENGA. Yes, I do think that we need to improve maintenance at the site. I mean you are correct, the accident report for the fire investigation indicated that we need to improve our practices. We have had discussions with the contractor. They clearly understand and acknowledge this and are in the process of already implementing changes to their procedures. Overall as you know, a percentage of the WIPP budget we have actually increased, from 2009 to 2013 we have increased our relative spending by about 32 percent on maintenance. So I think we are trending in the right direction and you might be right that in light of what we are finding now we may have to increase our spending somewhat in the remainder of '14 and in '15.

Mr. SIMPSON. Press reports have stated that the Department is continuing to negotiate the terms for the commissioning and start up of the salt waste processing facility at the Savannah River site that must be done before a new performance baseline for the project can be established. Previous reviews of the project have included warnings that DOE's failure to negotiate the contract by now past deadlines would have serious impacts on the project. Why have there been so many delays on finalizing the contract and establishing new baselines? How much have these extended negotiations cost the DOE in terms of schedule slippage? You've been negotiating for several years—years now. Do you have a timeline of when you expect to have an agreement?

Mr. HUIZENGA. Well, we broke the negotiations into two phases. So we renegotiated the construction part of the contract which is the active phase that we are in right now. And we wrapped those up with the ultimate construction complete date of December 2016 and the actual construction itself is going quite well at the moment and we hope to actually beat that date. The contract negotiations that we are currently involved in are for the next phase post construction in the commission phase and in the initial start up and operation of the facility. So we haven't actually lost anything on schedule because we are taking our time to negotiate this next phase of the contract.

Mr. SIMPSON. Okay.

Mr. HUIZENGA. And we are trying to make sure that we are striking the right balance between having a contractor being able to make a profit but taxpayers being able to not bear an unnecessary burden of the ultimate cost.

Mr. SIMPSON. The original performance baseline projected that construction would be completed in 2014 at a cost of $1.3 billion. That included the construction portion as well as the start up and commissioning. In the budget request you report that the Deputy Secretary approved a growth in contract cost of $330 million. Do you anticipate further growth beyond the $330 million?

Mr. HUIZENGA. That is what we are in the thick of right now, sir. I mean we are trying to actually figure out that was for the construction aspects and you know that was in part due to the 10 large vessels that we have procured and were delivered late. So we had to recover from that. I can't give you a sense of how this next phase is going to turn out because we are really making the sausage right now.

Mr. SIMPSON. Yeah. You done, Marcy?

Ms. KAPTUR. Yes.

Mr. SIMPSON. If there is nothing else then I thank you for being here today. We have kind of taken it easy on you.

Mr. HUIZENGA. Thank you.

Mr. SIMPSON. But you have a very important job and you have done a very important job over the last two years and we thank you for the work that you have done for the country and for the EM portion of the Department of Energy. And I do think we are moving forward. There are challenges and there will always be challenges as we learn new things in this arena. But I look forward to—that new Undersecretary has been nominated?

Mr. HUIZENGA. Okay. A new Undersecretary has been nominated and a new Assistant Secretary has actually been nominated for the EM job.

Mr. SIMPSON. And those nominations are?

Mr. HUIZENGA. Taken through appropriate time.

Mr. SIMPSON. In the body across the rotunda I guess.

Mr. HUIZENGA. Yeah.

Mr. SIMPSON. We actually get things done over here. I shouldn't say that—but anyway I appreciate it and thank you for being here today. I look forward to working with you as we try to complete this budget process.

Mr. HUIZENGA. Yeah.

Mr. SIMPSON. And make sure you keep us informed of what is going on at WIPP and what the potential impacts on our budget are going to be.

Mr. HUIZENGA. It has been an honor. I have worked with you, Mr. Chairman, and, you know, Representative Kaptur it's almost three years, it is not two years, it is almost three years now.

Mr. SIMPSON. Yeah, that is true.

Mr. HUIZENGA. So we have got a lot done with your support and there is more to do and we certainly appreciate your continued focus on the EM program. Thank you.

Mr. SIMPSON. Thank you. We are adjourned.

QUESTIONS FOR THE RECORD

SUBCOMMITTEE ON ENERGY AND WATER DEVELOPMENT
HOUSE COMMITTEE ON APPROPRIATIONS

ENVIRONMENTAL MANAGEMENT

FISCAL YEAR 2015 BUDGET HEARING

April 8, 2014

FINALIZING EXTRA FUNDING IN FY 2014

Subcommittee. Mr. Huizenga, the final fiscal year 2014 bill provided an additional $208 million above the budget request for environmental cleanup activities.

What has the extra funding been able to accomplish?

Mr. Huizenga. Section 301 of the Consolidated Appropriations Act, 2014 requires the Department to allocate funding consistent with the explanatory statement. Funds have be allocated consistent with the law to continue ongoing cleanup efforts including radioactive tank waste stabilization, treatment, and disposal; special nuclear material consolidation, stabilization, and disposition; transuranic and mixed/low-level waste disposition; and excess facilities deactivation and decommissioning.

Subcommittee. Several sites have reported that DOE has been holding back fiscal year 2014 funds. Are you holding back any of these funds? If so, at which sites and why?

Mr. Huizenga. The Department is not holding back FY 2014 funds. Sites will be provided funding consistent with approved spend plans, which in some cases includes the planned carryover of funds into FY 2015 for ongoing cleanup and support activities.

Subcommittee. Mr. Huizenga, the Defense Nuclear Facilities Safety Board recently sent you a letter that the ventilation system keeping the radioactive material contained underground at WIPP is not a credited safety system and therefore cannot be assured to prevent another release of radioactive material from the mine.

How likely is it that another release might occur? Do you agree with the Board's assessment?

Mr. Huizenga. We agree with the Board on the importance of the filtered ventilation system. Because of this concern, the Department took several actions to implement compensatory measures and to evaluate the ventilation system as outlined below. The filtered ventilation system is working as designed and protecting the safety of workers, public, and the environment. There are interim controls in place to provide greater assurance such that the likelihood of another release is very low. In addition, planning is underway to determine the appropriate upgrades required to support qualifying the ventilation system as a credited safety system.

Subcommittee. What are you doing to ensure the safety of the public and Department of Energy workers from further releases?

Mr. Huizenga. The Department took several actions to implement compensatory measures and to evaluate the ventilation system in order to ensure the safety of the public, the workers and the environment:

- DOE immediately began review and approval of all work activities in the Underground (U/G), U/G ventilation, and the waste handling building to assure appropriate compensatory measures were in place.
- On March 6, the two leaking design dampers were sealed to prevent further unfiltered release.
- As a result of executing the Department's Unreviewed Safety Question (USQ) process as described in the Department's rule 10

CFR Part 830, *Nuclear Safety Management,* operational restrictions were imposed on March 8 and March 11. The Department began implementing the following operational restrictions and compensatory measures to:

- o Prohibit the Waste Handling mode in the underground;
- o Not operate any U/G liquid fueled vehicles;
- o Continue to operate the Mine Ventilation System in Filtration Mode; and
- o Not enter the U/G ventilation exhaust drift.

- On March 12, the WIPP contractor, Nuclear Waste Partnership, LLC (NWP), issued additional operational restrictions to restrict combustible loading in the Exhaust Filter Building and around the associated ductwork.
- On March 19, in accordance with 10 CFR 830, NWP transmitted to the Department the WIPP Habitability Evaluation of the Safety of the Situation to formalize the implementation of the operational restrictions and compensatory measures.
- On March 21, the Department approved the Safety Evaluation Report (SER) approving the WIPP Habitability Evaluation of the Safety of the Situation (ESS) and on March 22 approved interim underground operational restrictions and requirements. The following four conditions of approval were added by the Department through the SER approval:
    - o The ESS alone is not sufficient for approval of underground activities, and DOE will continue to perform interim review and approval of proposed work and safety measures;

- o Vehicle barriers will be appropriately emplaced to protect the above-ground portions of the Exhaust Filter Building Ventilation System;
- o The contractor, NWP, is to identify all required support systems and report any deficiencies and compensatory measures and a timeframe for establishing corrective action plans or procedural controls; and
- o NWP was directed to provide a schedule for completion of a thorough evaluation of the filtered ventilation system vulnerabilities and identify potential compensatory actions.

A more comprehensive evaluation of the ventilation system and its support systems is currently underway. Corrective actions will be implemented upon completion of this evaluation.

Subcommittee. Do you think that DOE will need to upgrade the ventilation systems at WIPP?

Mr. Huizenga. A detailed evaluation of the ventilation system is part of the formal corrective action plan being developed. The Department's current plan is to upgrade the ventilation system. The details and extent of changes and improvements will be available on the WIPP Recovery website after they are finalized and approved.

IMPACT ON TRU WASTE REMOVAL COMMITMENTS

Subcommittee. Mr. Huizenga, the schedule to remove all legacy TRU waste from Area G at Los Alamos National under a new framework agreement was put into jeopardy as a result of the closure of WIPP. Moving this waste off the mesa has been a major concern for New Mexico, and the Department recently made short term arrangements for the WIPP material to be stored in Andrews, Texas.

Will this temporary storage contract at Andrews allow you to meet commitments you made to New Mexico for removal of legacy TRU waste from Area G in 2014?

Mr. Huizenga. Yes, the Nuclear Waste Partnership subcontract with Waste Control Specialists (WCS) of Andrews, Texas, provides temporary storage to allow removal of all the inventory of above-ground transuranic waste at Area G defined as 3706 cubic meters within the Framework Agreement. Thirty-nine shipments had been received by WCS, until a Potential Inadequacy in the Safety Analysis (PISA) was declared on May 1, due to the potential for the presence of untreated nitrate waste salts in waste packages received from a Los Alamos National Laboratory (LANL) waste stream, which had been emplaced in the suspected area of the event that led to radiological release. The PISA affects the balance of this LANL waste stream, including packages still at LANL and those already shipped to WCS. DOE is reviewing the possibility that a chemical reaction may have occurred within a drum, causing a potential release. Upon issuance of the PISA, DOE paused shipments to WCS on May 2, because they contained packages within this specific waste stream. Subsequently, the Texas Commission on Environmental Quality, the Texas state regulatory agency, directed WCS to refrain from any further LANL waste receipts until DOE, TCEQ and WCS better understand the issues related to the LANL waste. At this time we are evaluating the potential impacts of these delays and issues. DOE remains committed to completing the 3706 campaign as expeditiously as possible.

Subcommittee. How will the closure of WIPP impact your ability to meet commitments for the removal of TRU waste at other DOE sites?

Mr. Huizenga. We are carefully evaluating the impacts to other Department of Energy sites, including potential impacts on commitments with state regulators. Sites are continuing to characterize and certify transuranic waste for shipment to the Waste Isolation Pilot Plant (WIPP). We are working closely with the sites to ensure that adequate storage is available for certified waste until such time shipments to WIPP resume.

Subcommittee. In the event of an extended shutdown of WIPP, which states and milestones will be impacted first?

Mr. Huizenga. Any impact will depend on the length of the shutdown. Some impacts may include the Department's ability to meet: the removal of all legacy TRU waste from the Idaho National Laboratory by December 31, 2018, and certain milestones for the WIPP certification of remote handled and contact-handled TRU located at the Oak Ridge Reservation beginning September 30, 2015. Also, the 3706 Framework Agreement project milestone of June 30, 2014 for the removal of 3706 cubic meters of TRU waste from the Los Alamos National Laboratory (LANL), which has been on schedule, could be impacted if the pause in shipments to WCS continues much beyond mid-May, as discussed above.

NEW PROPOSALS FOR HANFORD CLEANUP

Subcommittee. Mr. Huizenga, the Department and the State of Washington have each put forth new proposals to modify the 2010 consent decree that governs the cleanup of Hanford's waste tanks.

What are the main differences between the Department's and the State's approach?

Mr. Huizenga. The state's proposal and DOE's proposal are similar in some ways. However, there are important differences between the proposals. First, the state's proposal seeks to import into the Consent Decree certain milestones that exist in the Tri-Party Agreement. Also, the state's proposal seeks to include numerous milestones for the completion of WTP. DOE proposes that more milestones will be created for the WTP at the proper time, most importantly, when the baseline is re-established and there is adequate confidence in the new proposed milestone dates. Finally, the state's proposal includes milestones to build up to an additional 8 one-million gallon double shell tanks.

Subcommittee. How do you intend to work with the states and members to gain support? Do you believe DOE will be able to bridge the gaps?

Mr. Huizenga. We are committed to working closely with Members of Congress, States, tribal leaders, affected communities and other stakeholders in an open and transparent manner as we confront the challenges involved in implementing DOE's diverse missions. It is important to sound decision making that the leadership of the Department have open lines of communication with the State of Washington, the congressional committees of jurisdiction, and the Members of Washington congressional delegation.

The Secretary has met with Governor Jay Inslee, tribal leaders, and with the local elected officials in the Tri-Cities area on issues related to the Hanford Site, including the Waste Treatment and Immobilization Plant. Most recently, I participated in a public town hall meeting to discuss the Department of Energy's proposal to amend the Consent Decree.

Subcommittee. There is some funding in your budget request for moving forward with parts of this framework proposal. Can you move forward without the State's agreement to modify the consent decree?

Mr. Huizenga. Yes. Our current approach to WTP includes the resolving the technical issues in the Pretreatment and High Level Waste Facilities and continuing construction in the areas not affected by the technical uncertainties. The Department's proposal also involves certain modifications to the Low Activity Waste facility processes that will facilitate the vitrification of low activity waste as soon as practicable.

DOE'S NEW FRAMEWORK PROPOSAL

Subcommittee. Mr. Huizenga, the State of Washington has been adamant that a new path forward at Hanford must be comprehensive and must have a clear schedule for all tank waste retrieval and treatment requirements

Do you believe the DOE framework proposal can provide a solution for 100% of the tank waste at Hanford?

Mr. Huizenga. On March 31, 2014, DOE offered to the State of Washington a proposal to amend the Consent Decree. DOE remains committed to the completion of the tank waste mission at Hanford.

Subcommittee. Is it feasible that you could still meet the existing 2040 and 2047 deadlines for tank waste retrievals?

Mr. Huizenga. Both the 2040 date for completion of tank waste retrievals and the 2047 date for completion of tank waste processing depend on a number of factors, including technical issue resolution in the WTP. We continue to analyze these factors to determine the impacts on schedules. As the path forward on WTP becomes more refined, the impacts on these dates will become clearer.

WORKING THROUGH THE TECHNICAL SAFETY ISSUES

Subcommittee. Mr. Huizenga, the previous Secretary of Energy assembled a panel of experts and conducted a technical review of the Waste Treatment Plant design.

Which design issues have been resolved and which are still outstanding?

Mr. Huizenga. The Department has made substantial progress on resolving technical issues associated with the High-Level Waste facility, however, full engineering, procurement, and construction (EPC) activities will not resume until all the technical issues have been resolved. There are more unresolved technical issues associated with the Pretreatment facility than with the High-Level Waste facility, so no EPC activities are planned until these issues are resolved and the Department approves a Safety Design Strategy. In both facilities, use of the Pulse Jet Mixers to keep solids in suspension remains one of the primary unresolved technical issues along with erosion and corrosion concerns in the facilities' piping and vessels. A path forward for each has been determined and a plan for Full Scale Vessel Testing is being implemented.

Subcommittee. How much of this budget request is devoted to technical resolution of the remaining outstanding issues?

Mr. Huizenga. Approximately $100 million dollars is identified for technical issue resolution in this budget request.

Subcommittee. What is the timeline for performing vessel testing and when will DOE provide more information on its testing plans?

Mr. Huizenga. Testing with the first vessel will be initiated in Fiscal Year (FY) 2014. The primary purpose of this testing is to demonstrate the Pulse Jet Mixer (PJM) control system design and operating concepts. The second vessel, which will be a replacement standardized vessel design, will be tested first at a small scale in FY 2014/FY2015, and then at full scale in FY 2015/FY 2016. The purpose of this vessel testing is to demonstrate PJM mixing performance and control system testing over the complete range of fluids and slurries planned to be processed in the Pretreatment Facility. The approach for this testing is described in the recently issued document, *U.S.*

Department of Energy Approach for Resolution of Pulse-Jet-Mixed Vessel Technical Issues in the Waste Treatment and Immobilization Plant.

NEW TANKS AT HANFORD

Subcommittee. Mr. Huizenga, the failures in management of the Waste Treatment Plant (WTP) project have been extremely frustrating, but everyone was reminded of what is really at stake here when the Department announced last year that it had discovered evidence of newly leaking tanks.

In light of the newly leaking tanks and continued delays of WTP, do you believe that the Department should construct new tanks at Hanford?

Mr. Huizenga. We are continuously evaluating the risks that the tank waste poses, and we firmly believe that the best path forward is to retrieve, vitrify, and treat the waste as soon as practicable. DOE does not believe it is necessary or prudent to commit significant resources at this time to building new double-shell tanks to store waste.

Subcommittee. What is the impact of the leaks identified thus far? Do you still believe there is no immediate health or environmental threat?

Mr. Huizenga. Most of the pumpable liquids in the single shell tanks (SST) have been transferred to double shell tanks (DST) for safe storage. Any remaining leakage from the T-111 is minimal and poses no risk to the public. The leakage from DST AY-102 is on the order of a few gallons per year from the primary tank into the annulus and is not leaking into the environment. Hence there is no threat to the environment or the public from AY-102.

Subcommittee. What would be the cost of new tanks and how many would be needed?

Mr. Huizenga. We do not believe any new double shell tanks are needed at this time. The cost to build new tanks would be in the range of $100M to $150M per tank depending on the size, number and location.

Subcommittee. The Department has little credibility on its ability to construct large projects on time. How can you build trust in EM to deliver early feed before the time that new tanks would come online?

Mr. Huizenga. DOE is in the process of assessing the modifications needed in the WTP to implement the Direct Feed LAW option. However, there are no known significant technical issues associated with these facilities and significant construction progress has been made in the Low Activity Waste Facility, the Analytical Laboratory, and the Balance of Facilities. In addition, the new support facility, the Low Activity Waste Pretreatment System will use known technologies and has a clearly understood scope. Given this, DOE feels confident it will be able to begin the DFLAW operations by 2022. In addition, we have sufficient available capacity in the existing double shell tanks to meet our mission needs for the foreseeable future.

Subcommittee. If the Department's framework proposal were agreed to, how quickly could you begin processing tank waste? Is 2019 a feasible date?

Mr. Huizenga. According to DOE's proposed Consent Decree amendment, we believe that the direct feed low-activity waste initiative will be ready to begin vitrification of supernate waste no later than December 31, 2022.

SALT WASTE PROCESSING FACILITY (SWPF)

Subcommittee. Mr. Huizenga, press reports have stated that the Department is continuing to negotiate the terms for the commissioning and startup of the Salt Waste Processing Facility at Savannah River, something that must be done before a new performance baseline for the project can be established. Previous reviews of the project have included warnings that DOE's failure to negotiate the contract by now-passed deadlines would have serious impacts on the project.

Why have there been so many delays on finalizing the full scope construction and startup contract and establishing a new baseline?

Mr. Huizenga. DOE continues to work diligently to negotiate the best possible agreement that:

- Is in the best interest of the taxpayer
- Ensures contractor accountability for all activities through facility operations
- Attains start of radioactive operations as soon as practicable

Subcommittee. How much have these extended negotiations cost DOE in terms of schedule slippage?

Mr. Huizenga. The duration of ongoing negotiations have not impacted the project schedule. The project is currently five to six months ahead of the December 31, 2016, contractual completion date based on the metrics in place to monitor project performance.

The SWPF project is 73% complete as of March 2014. The Earned Value Management System (EVMS) metrics for construction for the month of March and cumulatively since the construction phase was renegotiated, are as follows:

- Cost Performance Index: CPI month: 0.99 and CPI cumulative: 1.04
- Schedule Performance Index: SPI month: 1.07 and SPI cumulative: 1.06
- Variance at Complete (VAC): +$31.1M (current projected cost underrun below negotiated target costs)

- Construction forecast Completion Date: 7/15/16 vs.12/30/16 contract date
- Construction Estimate at Completion (EAC): $498.9M
- Several notable or projected accomplishments include:

- Electrical power provided to the facility switchgear
- Installed backup diesel generator structure and equipment
- Fire Water System Loop complete and energized
- Waste Transfer Line (WTL) will complete 350 days ahead of schedule (August 2014)

Subcommittee. You've been negotiating for several years now. Do you have a timeline of when you expect to have an agreement?

Mr. Huizenga. As a point of reference, the DOE began negotiations on the construction phase of the project March 2013 and reached an Agreement in Principle in April 2013. A modification to the contract was signed June 2013 that caps the taxpayer's liability for construction completion at $540M and has a target construction completion date of December 31, 2016. The contractor bears all costs above the $540 million cap until construction is complete.

DOE continues to work to attain the best possible agreement that is in the best interest of the taxpayer and ensures contractor accountability through commissioning and initiates facility operations as soon as practicable.

BEGINNING WORK AT PADUCAH

Subcommittee. Mr. Huizenga, the Paducah Gaseous Diffusion Plant has permanently shut down and the transfer back to the Department's control was expected to take place last summer. The Secretary of Energy testified last week that DOE isn't looking to award the new contract for deactivation services at the Paducah Gaseous Diffusion Plant this September.

Why has it taken so long for DOE to assume responsibility and get to work?

Mr. Huizenga. The DOE/USEC Lease Agreement for the Paducah Gaseous Diffusion Plant (GDP) requires USEC to provide a two-year notice of its intent to return the GDP to DOE. USEC notified DOE on August 1, 2013, of its intent to return the GDP, which would result in the return of the GDP in August 2015. Despite the two-year notification requirement, DOE is working with USEC on possibilities for an earlier return.

Early return is subject to several conditions including: 1) competitive selection of a deactivation contractor and 2) USEC fulfillment of its requirements under the Lease for the GDP return. Consistent with this approach, DOE is currently working to competitively procure a deactivation contractor. In addition, DOE and USEC are working on an agreement regarding the turnover provisions of the lease.

Subcommittee. The budget request states you are planning on using carryover from 2014 to offset costs in 2015. How much funding do you intend to carryover from 2014, and what work does the Department plan to accomplish at Paducah in 2015?

Mr. Huizenga. From FY 2014 to FY 2015 $8.4 million is expected to be carried over for the DUF6 Conversion Project and $93 million for the Gaseous Diffusion Project. A full breakout of Paducah's FY2014 expected carry over by PBS is listed below. The combined request and available resources from prior years are expected to provide for DOE to complete the transfer of the GDP, begin deactivation and stabilization activities, including deposit removal, and conduct DUF6 Conversion Project operations.

PBS Number	Amount
PA-0011	$ 112,000.00
PA-0011X	$ 8,342,636.89
PA-0013	$ 29,007.20
PA-0020	$ 3,633,103.42
PA-0040	$ 93,010,901.61
PA-0102	$ 685,296.30
PA-0103	$ 1,379,739.18
Total Paducah	$107,192,684.60

Subcommittee. Some members of the local community want DOE to start decontamination and decommissioning (D&D) activities right away.

How long will the Department wait to begin cleanup of the uranium enrichment plant?

Mr. Huizenga. At this time, DOE is focused on the safe return of the GDP from USEC and the initial deactivation and stabilization efforts needed to ensure the long-term safety of the facilities.

Subcommittee. Is there any funding in the budget request to start D&D activities at Paducah?

Mr. Huizenga. Deactivation and stabilization activities are the first steps in the decontamination and decommissioning process. The FY 2015 budget request includes funding for these activities.

FUTURE PLANS FOR PADUCAH

Subcommittee. Mr. Huizenga, the Department submitted a request for interest for the use of DOE facilities and stockpiles of depleted uranium to support new missions at Paducah. The Department announced last fall it had selected a reuse proposal submitted by GE-Hitachi.

Under what general terms would GE-Hitachi reinvest in Paducah? Can you provide an outline of how this deal would function?

Mr. Huizenga. Negotiations with GE-Hitachi Global Laser Enrichment (GLE) are ongoing. As such, additional information regarding potential terms of the deal cannot be disclosed at this time.

Subcommittee. Are there going to be any transfer of uranium tails in this deal?

Mr. Huizenga. The proposal offered by GLE would result in the sale of uranium tails to GLE.

Subcommittee. According to the information you've received, in what timeframe could a laser enrichment facility become operational at Paducah?

Mr. Huizenga. GLE has notified the Nuclear Regulatory Commission of its intent to request approval to build a laser enrichment facility at Paducah by 2016. GLE has not indicated when such a facility would be operational.

TANK WASTE STRATEGIES

Subcommittee. Mr. Huizenga, both Hanford and Savannah River have large amounts of highly radioactive liquid tank waste that must be disposed. So far, DOE has been successful in maintaining those legacy tanks and meeting its milestones for processing tank waste at Savannah River.

How does the plan for maintaining and cleaning up high level radioactive liquid tank waste at Savannah River compare to the strategies and requirements for cleanup up tank waste at Hanford?

Mr. Huizenga. Both the Savannah River Site (SRS) and the Hanford site tank waste strategies entail separating the waste into two streams – a low volume, highly radioactive stream and a high volume, low activity stream. The highly radioactive stream is to be converted into glass using the vitrification process, for disposal in a geologic repository. The low activity, high volume stream is to be treated into a stable waste form for disposal onsite as a low-level waste. At SRS, the vitrification process began in 1996 with the treatment of tank sludges in the Defense Waste Processing Facility. Separation of the salt waste, the majority of the tank waste, into low-activity and high-activity fractions on a production basis began in 2008. The low-activity waste is converted into a concrete-like material (called saltstone) and disposed of on-site. Since operations began more than 3,700 high level waste glass canisters have been produced and several millions of gallons of saltstone disposed. At Hanford, the Department continues to construct the facilities for separating tank waste into low-activity and high-activity fractions, as well as the facilities for treatment of these streams. The primary difference at Hanford is that some of the low-activity waste stream will be converted to a solid waste form using the vitrification process.

Subcommittee. Are there lessons from Savannah River that could be useful for formulating a strategy at Hanford?

Mr. Huizenga. Although the waste at SRS is much more homogeneous than the high level waste at Hanford, there is still a significant amount of operational and technical information from the SRS tank waste mission that is applicable to the Hanford tank waste mission. The Department utilizes a Tank Waste Corporate Board to address DOE complex-wide tank waste issues. In addition, the principal contractor for the limited liability corporations is present at both Hanford and the Savannah

River Site. Over the last two years there have been a number of changes in management between the two to ensure that positive lessons are exchanged and unproductive processes are avoided.

The Department also utilizes representatives from different DOE sites or contractor organizations for periodic peer reviews of its major tank waste construction projects, to identify lessons-learned that might be used elsewhere. In addition, certain technologies that were successful at one site have been utilized at other sites.

Subcommittee. Do the tanks at SRS pose different risks, or are the programmatic differences more linked to the regulatory requirements?

Mr. Huizenga. The volume of tank waste at Hanford is higher than that at the Savannah River Site (56 million gallons vs. 39 million gallons), and is stored in many more tanks (177 vs. 47). However, at Hanford, campaigns performed in the 1970's and 1980's removed much of the radioactive cesium and strontium source terms from the tanks and transferred them to capsules that are stored elsewhere on the site. Additionally, the Hanford tank waste is more chemically complex, as a result of utilizing a greater number of chemical nuclear separation processes than at the Savannah River Site, which complicates the ability to retrieve and immobilize wastes using a single technology. Another factor posing differences is tank construction. At Hanford, only 29 of the tanks (less than 20 percent) have a double shell construction to contain the contents, and at Savannah River almost 50 percent of the tanks have double shells. Many of the non-double shell tanks have pans outside the single shell that extend vertically to about one-third of the tank height, providing some leak retention capability.

From a regulatory perspective both sites are regulated under Federal Facility Agreements, that include DOE, the state, and the Environmental Protection Agency as parties to the agreement; however, other regulatory arrangements differ. For example, the State of Washington applies the Resource Conservation and Recovery Act to the Hanford tanks, while at the Savannah River Site, many of the tank waste activities are regulated under South Carolina's waste water operating permit requirements. This results in certain differences in how chemical hazards of the waste need to be addressed.

PROCESSING SPENT FUEL AT H-CANYON

Subcommittee. Last year, the Department issued an amended decision to expand the operations at H-canyon to receive and downblend fuel from U.S.-origin highly enriched uranium from Canada, a deliverable from the 2012 Nuclear Security Summit. The Office of Environmental Management manages L-Basin, but the majority of the spent fuel currently in storage there is from foreign and domestic research reactors transported there by NNSA as part of the Global Threat Reduction Initiative (GTRI).

L-Basin is at storage capacity for High Flux Isotope Reactor (HFIR) cores and is projected to reach its storage capacity for other used nuclear fuel as early as 2016. EM is planning a new reprocessing campaign to free up storage space.

How much funding does NNSA provide to EM for H-canyon processing and L-basin storage in support of its nonproliferation programs?

Mr. Huizenga. NNSA does not provide any funding to EM for processing spent fuel at H-Canyon, but has provided some support for SNF storage at L-Basin. Based on an Agreement between NNSA and EM, high income economy countries pay a fee to send SNF to SRS for storage at L-Basin. This fee helps offset some of the costs for management and disposition of SNF.

GTRI has been supportive of the SNF Program at SRS and of EM's request to increase the fee. GTRI has also provided funding for:

- A SNF shipment from Chile in 2010, approximately $500K.
- Purchase of additional spent fuel storage racks at L-Basin in 2011–2013, approximately $2M
- Modification to the fuel transfer system in L-Basin in 2013, approximately $2.25M.

Subcommittee. Will NNSA contribute any funding to the reprocessing campaigns?

Mr. Huizenga. NNSA/GTRI is not contributing funding to process spent nuclear fuel at H-Canyon. GTRI has supported EM's efforts to recover the full cost of down-blending liquid HEU in H-Canyon from Canada.

Subcommittee. Would you need to reprocess this fuel if the GTRI program didn't need additional space in L-basin, which is at capacity?

Mr. Huizenga. L-Basin is only at full storage capacity for cores from the High Flux Isotope Reactor (HFIR). DOE is processing SNF to reduce its overall cost of managing fuel. Processing eliminates the need for additional SNF storage racks in the L-Basin facility and allows for future receipt of foreign and domestic SNF. Continued receipt of HFIR cores from the ORNL in support of DOE's research and development mission can resume once processing of HFIR fuel in H-Canyon begins.

Subcommittee. What alternatives are you considering for the new campaign?

Mr. Huizenga. The Department considered a number of alternatives when it prepared the SNF Environmental Impact Statement, a subsequent 2013 Supplemental Analysis, and the Record of Decision Amendment, and for the reasons stated therein, decided to process a limited amount of SNF.

DELAYS IN URANIUM-233 DISPOSITION

Subcommittee. Mr. Huizenga, the Omnibus includes language that directs the Department to provide the subcommittee a clear plan to remove all U-233 from Oak Ridge by 2019, along with an analysis of the cost and schedule implications if the Department cannot dispose of some of those materials as planned at Nevada.

Is the Department any closer to resolving the concerns of the State of Nevada regarding disposal of the DOE materials?

Mr. Huizenga. The Department continues to work with Nevada officials through the senior level Working Group established by Secretary Moniz and Governor Sandoval. The Department has completed the actions requested by the Working Group to date. The Working Group will meet again in early May to discuss this matter.

Subcommittee. What activities can move forward in meantime? Will you move forward with the building modifications and plans for reprocessing the remaining material onsite?

Mr. Huizenga. Currently, the Department is maintaining a readiness to initiate the U-233 direct disposal campaign. In parallel, planning is underway for the required modifications to Building 2026 for processing the portion of the inventory that is not CEUSP.

QUESTIONS FROM CHAIRMAN SIMPSON

DOE LEADERSHIP TRANSITION

Chairman Simpson. Mr. Huizenga, we recognize and appreciate the great work you've done to advance the cleanup program. There have been many tough issues to deal with, many of which are incredibly complex and technical. It took several years for problems at the Waste Treatment Plant to grab the former Secretary's attention. Funding in the fiscal year 2015 budget request seems to be largely consistent with last year's budget request, with just a few realignments.

How does this budget request reflect the areas you are particularly concerned about?

Mr. Huizenga. The FY 2015 Budget Request for the Environmental Management (EM) program is $5.622B. The EM portfolio consists of six functional areas, all of which are significant to the achievement of EM's mission. This budget reflects funding for each of the categories as follows:

1. Radioactive Tank Waste ($2,042M / 36%)
2. Facility Decontamination and Decommissioning ($992M / 18%)
3. Special Nuclear Materials and Used Nuclear Fuel ($971M / 17%)
4. Transuranic and Solid Waste ($758M / 14%)
5. Soil and Groundwater ($466M / 8%)
6. Site Services ($392M / 7%)

EM conducts cleanup in these areas within a "Safety First" culture that integrates environmental, safety, and health requirements and controls into all work activities. This ensures protection to the workers, public and the environment.

Chairman Simpson. How would you characterize the changes that have taken place in your budget under the leadership of Secretary Moniz?

Mr. Huizenga. Throughout my time in EM, Secretary Chu and Secretary Moniz have been very supportive of and engaged in furthering the

EM mission. Secretary Moniz has been a strong advocate for EM and has a deep knowledge and understanding of our successes and our challenges. EM continues to pursue its cleanup objectives safely within a framework of regulatory compliance commitments and best business practices.

WASTE ISOLATION PILOT PLANT (WIPP)

Chairman Simpson. Mr. Huizenga, two incidents happened in February at the Waste Isolation Pilot Plant (WIPP) that shut down operations at that facility. One of those incidents, a fire, has already been found to have been entirely preventable. We know very little about the second incident, which resulted in a release of radioactive material to the environment and has prevented entry into the mine for the past several weeks.

What is happening at WIPP?

Mr. Huizenga. On February 5, 2014, a salt haul truck caught fire. Workers were evacuated and the underground portion of WIPP was shut down. Several workers were treated for smoke inhalation, but no injuries occurred.

On February 14, 2014, a second unrelated event occurred when an underground continuous air monitor (CAM) alarmed during the night shift. The continuous air monitor measured airborne radioactivity close to the operating location where waste was being emplaced. When the CAM alarmed, the underground ventilation system (UVS) automatically switched to HEPA filtration mode. The two bypass dampers automatically closed, and the 860 fan vortex damper was manually opened and was adjusted to achieve designated airflow through the high-efficiency particulate air (HEPA) filters that captures radioactive particles.

DOE has carefully planned and completed multiple manned entries into the underground repository to investigate the source of the radioactive release and is working to determine the cause of the release.

As a result of the February 5, 2014, fire incident, the Department's Office of Environmental Management (EM) established an Accident Investigation Board (AIB) to assess the WIPP safety systems programs and processes at the federal and contractor level. This investigation included analysis of training and qualifications, maintenance and emergency management response to the incident.

The DOE AIB uses a rigorous process to investigate events that had or potentially could have had a negative impact to the employees, public or the environment. The AIB report on the haul-truck fire was released March 7, 2014.

EM released the initial accident investigation report related to the February 14, 2014 radiological release on April 24, 2014. The report's initial investigation focused on the reaction to the radioactive material release, including related exposure to above-ground workers and the response actions. After the entry teams determine the source of the radiological event, the accident investigation board will release a supplemental report focused on the direct cause of the release and worker protection measures in the underground facility.

Both the vehicle fire and initial radiological release reports are available on the Department's website at

Fire report: http://energy.gov/em/downloads/accident-investigation-report

Radiological report: http://energy.gov/em/downloads/radiological-release-accident-investigation-report

As the result of these events, the WIPP repository is not accepting any waste shipments. The Department is developing a recovery plan, one of many steps and processes that need to be completed before WIPP returns to operations.

Continuing environmental monitoring, including air, water and soil testing, indicates radioactive levels are near background levels and, as a result, we expect no adverse impact of consequence to people or the environment.

Chairman Simpson. How long do you think WIPP is going to be shut down? Are we talking a few weeks, months, or years?

Mr. Huizenga. It is premature to estimate how long WIPP will be shut down until DOE determines the source of the radiological release and completes detailed planning required to implement corrective actions in response to the vehicle fire and initial and supplemental radiological release Accident Investigation Board reports.

Chairman Simpson. How will an extended shutdown impact commitments made to states for removing TRU Waste? How will the closure of WIPP impact your ability to meet the milestone for shipping TRU waste out of Idaho in 2014?

Mr. Huizenga. The Department is evaluating impacts on commitments made to states regarding the removal of transuranic (TRU) waste from DOE sites, and is developing options and executing approved plans to minimize impacts to the degree possible.

Sites are continuing to characterize and certify transuranic waste for shipment to the WIPP. We are working closely with the sites to ensure that adequate storage is available for certified waste until such time shipments to WIPP resume.

Chairman Simpson. Do you have any rough order of magnitude costs to recover operations at WIPP?

Mr. Huizenga. The Office of Environmental Management is working with its Carlsbad Field Office (CBFO) to develop a plan and schedule for recovery from the salt haul vehicle fire and radiological release events that occurred in February 2014. The objective is to safely restore the WIPP facility and resume normal transuranic (TRU) waste disposal operations. The root cause of the incidents is still not precisely known, so the total cost and detailed schedule for the recovery plan is still under development.

Chairman Simpson. Will you need to submit a reprogramming in 2014 or change the budget request for 2015 to cover those costs?

Mr. Huizenga. The Department is currently evaluating impacts on fiscal year (FY) 2014 work in progress, and FY 2015 plans, both in response to the fire and radiological events at WIPP and impacts of the WIPP shutdown on TRU waste generator sites. The root cause of the incidents is still not precisely known, so cost and schedule for the recovery plan is still under development.

MAINTENANCE AND FUNDING FOR WIPP

Chairman Simpson. Mr. Huizenga, in 2014, the Omnibus provided an additional funding above the request specifically to address deferred maintenance at WIPP. Yet, your budget justification states you plan to spend only $10 million total on maintenance in 2014, $2 million less than last year's plans, despite having those additional funds.

The accident investigation into the salt truck fire concluded that the failure to conduct adequate periodic maintenance on the truck was a root cause of the fire.

The Department has still not completed all corrective actions it said it would in response to a letter sent by the Defense Nuclear Facilities Safety Board back in 2012 identifying poor maintenance practices at WIPP.

What are your plans to address the maintenance problems at the site?

Mr. Huizenga. We are currently reviewing maintenance requirements, schedules and procedures as part of the development of a corrective action plan. Maintenance is a key part of the formal corrective action plan currently being developed. Upgrades and/or replacements to facilities, equipment and infrastructure will be made, as necessary, to ensure safe and efficient operations. A robust maintenance program will be a key element of future operational plans. In addition I have recently issued guidance to all of our sites requesting the details of their required maintenance upgrades in light of the WIPP challenges and asking them to consider and prioritize their maintenance needs.

Chairman Simpson. Do you think that there needs to be a greater emphasis placed on improving maintenance at the site?

Mr. Huizenga. Safe and efficient facilities and equipment is a high priority. We are evaluating areas of potential improvement in our maintenance requirements, schedules and procedures.

TAXES ON THE UTILITY INDUSTRY

Chairman Simpson. House Report 112-462, FY13 House Energy and Water Development bill as follows:

"For the fourth year in a row, the budget request includes a request to reauthorize section 1802 of the Atomic Energy Act of 1954 and institute an additional tax on our nation's nuclear utilities. The Department still has not developed a reliable estimate on the total costs to clean up the three gaseous diffusion sites. It also has not explained how reductions in the amount of requested funding or how the additional funding the Department is generating through the questionable use of its uranium bartering arrangement will impact the rate at which the Fund is depleted. At a time of rising energy prices, passing on these costs to industry and ultimately energy consumers without performing the most basic federal planning activities is indicative of the Department's continued reliance on off-budget measures to provide temporary stopgaps instead of developing credible and affordable plans to meet clean up commitments."

In our report two years ago we questioned the four years in a row request for a tax on the utility industry to raise another \$2.4 billion in revenue for the D&D Fund. Since then five nuclear plants have announced shutdowns and we expect more to come. Again, you have included the reinstitution of the D&D fund tax on utilities for the sixth time when the fund has a balance of \$3.52 billion. We are concerned about the impact of additional costs on the nation's nuclear plant fleet in a low consumer demand, low natural gas price environment. Do you share our concern?

Mr. Huizenga. The Department believes the reinstitution of the utilities' contribution to the Uranium Enrichment Decontamination and Decommissioning Fund (UED&D) is necessary and appropriate. There is currently insufficient funding to cover the total cost to D&D the gaseous diffusion plants, which for many years, operated to meet both national security and commercial enrichment needs.

Chairman Simpson. Last year the nation's utility regulators, National Association of Regulatory Utility Commissioners (NARUC), passed a resolution opposing the reinstitution of the D&D fund tax on utilities. Are you aware that they had passed this resolution? Do you understand their concern about adding more costs on the bills of consumers of electricity generated by nuclear power?

Mr. Huizenga. The Department is aware of the NARUC resolution.

Chairman Simpson. This Subcommittee observed two years ago that DOE had not developed a reliable estimate on total costs to clean up the three gaseous diffusion sites. Your Triennial report to Congress on cleanup costs was due to us last October. When do you expect this report to be delivered? Wouldn't it be more transparent to policymakers and understandable to the public if DOE provided more frequent updates on cleanup activities and costs than once every three years?

Mr. Huizenga. The 2013 Triennial Report is in the final stage of review and should be submitted to the Congress in the very near future. We are providing the Triennial Report in accordance with the schedule established in section 1805 of the Atomic Energy Act of 1954, as amended by the Energy Policy Act of 1992, which calls for the submission of the report every three years.

Chairman Simpson. Were you aware that nuclear plant owners report on their plant's status every quarter to the NRC called the Reactor Oversight Process? The NRC's Reactor Oversight Process is the agency's program to inspect, measure, and assess the safety performance of commercial nuclear power plants and to respond to any decline in performance. It reflects the Commission's strategic goals for safety, security, openness, and effectiveness. Do you believe it is fundamentally fair for the federal government to require private industry to report these indicators quarterly when government itself cannot manage to produce a report on similar criteria once every three years? Why or why not would you recommend a quarterly report to Congress on DOE cleanup?

Mr. Huizenga. The Department continuously monitors its progress in the decontamination and decommissioning and cleanup of the three gaseous diffusion sites. In regard to the reporting frequency, adequacy of the Triennial Report to Congress, the Department believes these updates provided pursuant to the congressional schedule provide sufficient information.

Chairman Simpson. The 1992 EPAct was clear that remedial action costs should be paid from the D&D Fund only to the extent that the amount available in the Fund was sufficient. Are amounts in the Fund sufficient to undertake remedial activities? Has the GAO ever stated that DOE has used the Fund for activities not associated with D&D? Do you believe you have exercised strict oversight of cleanup activities that would prevent funds appropriated from being used for other purposes?

Mr. Huizenga. Currently, the UED&D Fund balance is adequate for the Department to continue to undertake remedial activities. As noted above, the UED&D Fund 2010 Report to Congress (the sixth Triennial Report) estimated the Fund shortfall to be approximately $11.8 billion. The Department exercises strict oversight of cleanup activities to ensure funds are not used for other purposes. To the best of its knowledge, the Department does not believe the GAO has ever reported concern that DOE has used the UED&D Fund for activities not associated with D&D.

EM LIABILITIES

Chairman Simpson. In your testimony before this subcommittee, you said EM has an estimate of $200 billion to complete the work currently on your books. You also mentioned additional DOE environmental liabilities that are the responsibility of NNSA, the Office of Nuclear Energy and the Office of Science. Can you tell us the estimated cost to address the legacy DOE environmental liabilities that are not currently part of the EM program?

Mr. Huizenga. The EM Program's estimated Life-Cycle Costs to Complete are used as part of a Department-wide effort to estimate the Department's Environmental Liability, which is included in the Department's Agency Financial Report. The liability is reported in "constant" dollars that are not affected by general price inflation. These costs are normalized for the year they are reported (in this case 2013). Whereas the $200 Billion estimate you have cited is expressed in "current" dollars, which takes into account escalation over the multiple decades remaining in the EM Program's life-cycle. The distribution of the Department's Environmental Liability is shared by a number of programs across the Department for a wide variety of activities that span a long time period, summarized in Table 1 (shown below).

The EM Program's remaining cost for the remainder of the Environmental Liability forms the largest fraction (more than 60%) of this estimate.

The Other Contributions of the Department's Liability (approximately 10% of the Department's Environmental Liability) concerns the management of environmental scope that has not been formally assigned to specific programs.

Table 1, The Department's Environmental Liability as Recorded in the FY 2013 Annual Financial Report by Program Office

Program Office	**Department's Environmental Liability as Recorded in the FY 2013 Annual Financial Report ($ Billion)**	**Percentage of the Department's Environmental Liability**
Environmental Management Program	$180.54	64.4%
National Nuclear Safety Administration	$48.61	17.3%
Office of Science	$9.49	3.4%
Naval Reactors	$7.25	2.6%
Office of Legacy Management	$5.11	1.8%
Office of Nuclear Energy	$0.50	0.2%
Other Contributions	$28.78	10.3%
Total	$280.27	100%

QUESTIONS FROM MR. GRAVES OF GEORGIA

TITLE X REIMBURSEMENT

Mr. Graves. Title X of the Energy Policy Act of 1992 requires the Department of Energy to reimburse, at least annually, licensees of active uranium and thorium processing sites for costs incurred to remediate certain sites that provided uranium and thorium concentrate in support of U.S. defense programs. Fourteen sites – thirteen uranium sites and one thorium site – were determined to qualify for reimbursement. Reimbursements began in FY 1994 and in its annual budget requests, the Department asked for commensurate funds to support the program.

However, starting in FY 2009, the Department ceased requesting funding in its annual budget for Title X reimbursement. These funds cover remediation work that has already been completed and for which the federal government has a legal obligation to pay. This failure by the Department has led to the accumulation of a $54 million backlog in unpaid claim balances as of December 2013.

At least one of these sites is facing a cessation of remediation activities unless it can recover at least some of the $15 million in reimbursements it is owed. It is unacceptable for the federal government to abandon communities with unfinished radioactive waste remediation projects that at best will have no restart date in sight and at worst will remain a hazard to peoples' health forever without further intervention.

Why has the Department failed to include sufficient resources within its annual budget submission to reimburse the Title X licensees for their efforts to bring these sites to closure, despite a legal obligation to do so? Absent fulfilling this legal obligation, what plan does the Department have to remediate these sites and protect the health and safety of the communities in which they are located?

Mr. Huizenga. Taking many variables into account, EM has generally prioritized its cleanup activities as follows:

- Activities to maintain a safe, secure, and compliant posture in the EM complex
- Radioactive tank waste stabilization, treatment, and disposal

- Spent (used) nuclear fuel storage, receipt, and disposition
- Special nuclear material consolidation, stabilization, and disposition
- Transuranic and mixed/low-level waste disposition
- Soil and groundwater remediation
- Excess facilities deactivation and decommissioning.

The Department supports the Title X Uranium and Thorium Reimbursement Program and has been able to provide reimbursements to uranium and thorium licensees through fiscal year (FY) 2012. In accordance with section 765.20(g) of 10 CFR Part 365 (revised), the Department continues collection of annual claims. Each year, the Department publishes a Federal Register Notice requesting uranium and thorium licensees to submit their claims to the Department for cleanup work performed in the prior fiscal year, which identifies that the ability to reimburse approved claims is subject to the availability of funding. Any remaining unpaid approved claims are carried over to the next fiscal year, until they can be paid in full by the Department.

The Department does not have the authority to conduct the actual physical cleanup at these privately owned sites.

TUESDAY, MARCH 25, 2014.

APPLIED ENERGY FUNDING FY 2015 BUDGET

WITNESSES

DAVID DANIELSON, ASSISTANT SECRETARY, ENERGY EFFICIENCY AND RENEWABLE ENERGY, U.S. DEPARTMENT OF ENERGY

PETE LYONS, ASSISTANT SECRETARY, NUCLEAR ENERGY, U.S. DEPARTMENT OF ENERGY

CHRISTOPHER SMITH, ACTING ASSISTANT SECRETARY, FOSSIL ENERGY, U.S. DEPARTMENT OF ENERGY

PATRICIA HOFFMAN, ASSISTANT SECRETARY, ELECTRICITY DELIVERY AND ENERGY RELIABILITY

Mr. SIMPSON. Welcome this morning to the hearing. The hearing will come to order. Let me just state that there is about five or six other hearings going on at the same time for Appropriations Committee members, so I suspect that you will see people running in and running out and back and forth during the hearing.

But I would like to welcome our witnesses, Dr. David Danielson, Assistant Secretary for Energy Efficiency and Renewable Energy; Dr. Pete Lyons, Assistant Secretary for Nuclear Energy; Pat Hoffman, Assistant Secretary for Electricity Delivery and Energy Reliability; and Christopher Smith, Acting Assistant Secretary for Fossil Energy.

But before I begin, and before we get started, I would like to take a moment to say how much I look forward to working with Ranking Member Kaptur and all the other members of this subcommittee. I have been a member of this subcommittee for about 10 years, and I have great appreciation for the importance of the issues under its jurisdiction. This is the first hearing that I have actually chaired as chairman of this subcommittee, so it is a new role for me. And I look forward to, as I said, working with our ranking member and for her valuable input on this Department.

Your programs account for more than $3.8 billion of the Department's budget request for fiscal year 2015. I must note that while the request is more balanced than last year, the two accounts, Nuclear and Fossil, which Congress increased last year, received reductions. To the extent that the President is serious about an "all-of-the-above" energy strategy, I would hope that this is the last year we see this imbalance in the request. Not surprisingly, I know the work funded by Nuclear Energy the best, but I also know the importance that these programs hold, not just for the American industrial competitiveness but also for the comfort, safety, and well-being of all of our constituents.

As Assistant Secretaries, you have both managerial and leadership roles to the people and programs under your responsibilities. I am sure you will agree that these can be distinct from each other, but both require a strong vision of your mandate and operation.

Unfortunately, simply reading your budget request does not give me much insight into the vision each of you has for your programs. This is a question which I will ask Secretary Moniz to cover for the Department overall, but I expect that you will be able to provide us with your answers today.

Given the number of opening statements which we have before we get into questions, I will keep this short, and I will ask that each of you do the same. Please ensure that the hearing record, questions for the record that include supporting information requested by the subcommittee are delivered in final form to us no later than 4 weeks from the time you receive them. Members who have additional questions for the record will have until close of business tomorrow to provide them for the subcommittee office.

And I will say that this is kind of an accelerated hearing schedule that we are having throughout all of the appropriation bills, because we are going to actually try something new this year in both the House and Senate, and that is to do our job and do it on time, and try to get appropriations done so that you know what your budget is going to be when the first of the fiscal year rolls around. So we are having accelerated hearings in all of the subcommittees, which brings a lot of conflicts going on for members as we try to get this done.

But I think the hearing schedule should be complete by the middle of April and we will be done with that and then we will start marking up appropriation bills and try get them to the floor. And, of course, a lot of it depends on the floor time that is available in the House and the Senate.

So with that, I will turn to my ranking member, Ms. Kaptur, for her comments.

Ms. KAPTUR. Thank you, Mr. Chairman. And I must say that it is a pleasure to work with a regular-order member who wants to get the job of this subcommittee, full committee, and the Congress done on schedule. And perhaps even early.

It is a distinct honor to welcome Dr. Danielson. It is good to see you again. Thank you for your hard work.

And, Dr. Lyons, thank you so very much for being here today.

And Secretaries Smith and Hoffman, thank you all for coming today and updating our subcommittee on your programs.

I have long cited America's reliance on foreign energy as a grave economic and primary national security concern. Over the last decade, the people of our Nation have spent $2.3 trillion on importing and consuming foreign oil, predominantly, diverting our wealth and job creators to some of the worst global players at the expense of our own citizens and nation. The recent events in Ukraine provide an abject lesson, lest we forget our own country's challenges on the strategic importance of reliable energy in defending the borders of sovereign nations. The dependence of Ukraine and much of Europe on Russian energy imports have complicated the international response to Russia's illegal invasion of Crimea.

With this in mind, Secretary Smith, I hope that you can help us understand the circumstances surrounding the availability of our country's resources and the implications of exporting these assets. And we will have more in the question period on that.

And further, somewhat parochially, I would like to explore what you can tell us about the coastal infrastructure for export, including in the Great Lakes region; that coastline, the longest in our country, actually.

I represent a part of the Nation that has worked very hard to develop all sources of energy, from the photovoltaic silver manufacturing in the Toledo region, including launching the first solar company that is doing quite well right now; oil refining at Oregon Nuclear Energy in Oak Harbor; and offshore wind, hopefully, in Lake Erie, advanced batteries in Cleveland. And our State is now experiencing a boom of natural gas exploration in eastern Ohio. But by and large, our region competes in the harshest of free markets. It is a merchant economy with no historic record of Federal subsidy for either energy or power. We lack the directed manages and engagement of a national lab driving regional development and innovation or a power authority providing subsidized power to our homes and businesses.

For my district and State, energy supplies a significant financial strain on the citizens and businesses striving to get through each day. So I am particularly interested in policies, expert innovation, investment, and drive down costs and support regional energy equity.

I suspect today you will address how each of your programs is meeting Nation's challenges related to our energy sector in an era of budget austerity. I am focused on understanding the technological challenges that face each of these sectors so that collectively, we can make informed and wise decisions to shepherd our resources towards those areas with the largest return.

Dr. Danielson, finally—and I just left a meeting of the Steel Caucus. The Advanced Manufacturing Office came up during the question period. You are at the forefront of reinvigorating our country's manufacturing capability, an issue of intense national importance. As our Nation has lost about a third of its manufacturing jobs and the middle class shrinking because of it, I am very concerned about indications that America is losing her competitive advantage in many emerging energy technologies. And interested to hear about opportunities to not only remain competitive, but restore our position as the global leader in new energy technology.

So we look forward to hearing how we can protect our investments in research and development, intellectual property poaching to protect our investments in research and development for intellectual property poaching and ensure that our efforts further domestic manufacturing rather than commercialization overseas.

I thank you, Mr. Chairman, for the time and look forward to the testimony.

Mr. SIMPSON. Thank you. And before we turn to you for your testimony, let me make an announcement. We have had an addition to our Energy and Water staff born last week. Rob is a new father of Afton Riggs, and we are very proud to have a new Energy and Water Appropriations staff member here. And we actually had a flag flown over the Capitol in his honor so that when he gets to be 20, 25 years old you can say, yeah, the old man did that. So congratulations.

Mr. BLAIR. Thank you very much.

Mr. SIMPSON. Dr. Lyons, we will start with you first.

Mr. LYONS. Thank you. Chairman Simpson, Ranking Member Kaptur, and members of the subcommittee. Thank you for the opportunity to appear before you today to discuss the President's fiscal year 2015 budget request for the Office of Nuclear Energy at the Department of Energy. This past year has been an historic one for nuclear energy. Construction of the first new nuclear builds in this country in more than 30 years continued with completed base map foundations for two new reactor units at V.C. Summer in South Carolina and two new plants at Plant Vogtle in Georgia.

Last month, the Secretary announced that two of the owners of Plant Vogtle would receive a $6.5 billion loan guarantee. New nuclear builds, in addition to the currently operating nuclear power fleet, play an important role in President Obama's Climate Action Plan to reduce greenhouse gas emissions as well as achieving American energy independence.

While we are celebrating new nuclear construction in South Carolina and Georgia, we must also look ahead to the future of nuclear reactor technology. In 2013, the Office of Nuclear Energy announced a second funding opportunity announcement, or FOA, to execute cost-shared, first-of-a-kind engineering and design development work to help accelerate the timelines for commercialization of small modular reactors.

In December, we selected NuScale power under this FOA for a licensing technical support award. For this FOA, we solicited innovations that can improve safety, operation, and economics through lower core damage frequencies, longer post-accident coping periods, enhanced resistance to hazards presented by natural phenomena, and potentially reduced emergency preparedness zones, or workforce requirements.

These new small modular reactors, as well as the Westinghouse AP 1000 reactor, are designed with passive safety features to minimize any requirement for prompt operator action, and prevent auxiliary system failures from contributing to future accidents. Passive safety further enhances the safety of nuclear power plants.

Another essential research development on the horizon in fiscal year 2015 is the planned restart of the Transient Test Reactor, or TREAT at the Idaho National Laboratory. Transient testing will enable our programs to understand fuel performance as well as provide a capability to screen advanced fuel concepts, including accident-tolerant fuels, which allows for early identification of the limits of fuel performance.

Finally, although this year has brought many exciting developments in new nuclear power construction and technologies, it has, unfortunately, also been a year of unprecedented nuclear power plant closures. The shutdown of these power plants is a significant loss of low carbon electricity. Beyond emission, these closed nuclear power plants are a considerable loss of base load electricity supply and a loss of energy diversity. America's nuclear power fleet is a national asset on many fronts, and our programs continue to ensure nuclear power remains a key player in America's clean energy future.

In summary, the President's fiscal year 2015 budget requests 863 million for the Office of Nuclear Energy, a decrease of 2.8 percent from the fiscal year 2014 enacted budget and an increase of 17 percent above the fiscal year 2015 request.

I look forward to responding to your questions.

Mr. SIMPSON. Thank you.

[The information follows:]

Statement of Peter Lyons
Assistant Secretary for Nuclear Energy
U.S. Department of Energy
Before the
Subcommittee on Energy and Water Development, and Related Agencies
Committee on Appropriations
U.S. House of Representatives

FY 2015 Appropriations Hearing
March 25, 2014

Chairman Simpson, Ranking Member Kaptur and Members of the Subcommittee, thank you for the opportunity to appear before you today to discuss the President's fiscal year 2015 budget request for the Office of Nuclear Energy (NE) at the Department of Energy.

This past year has been another historic one for nuclear energy. Construction of the first new nuclear builds in this country in more than 30 years continued with completed basemat foundation pours for two new reactor units at VC Summer in South Carolina and two new units at Plant Vogtle in Georgia. Last month, the Department of Energy's Loan Programs Office also announced that two of the owners of Plant Vogtle will receive a $6.5 billion loan guarantee. Together these newly constructed units will provide enough reliable, low-emission, baseload electricity to power 3 million homes in the Southeastern United States. New nuclear builds, in addition to the currently operating nuclear power fleet, will also play an important role in President Obama's Climate Action Plan to reduce greenhouse gas emissions, as well as achieving American energy independence.

While we are celebrating new nuclear construction in South Carolina and Georgia, we must also look ahead to the future of nuclear reactor technology. In 2013 the Office of Nuclear Energy announced a second Funding Opportunity Announcement (FOA) to execute cost-shared first-of-a-kind engineering and design development work to help accelerate the timelines for commercialization of Small Modular Reactors (SMRs). In December 2013, DOE selected NuScale Power, LLC, headquartered in Corvallis, Oregon, under this FOA for an SMR Licensing Technical Support award. For this FOA, the Office of Nuclear Energy solicited innovations that can improve SMR safety, operations and economics through lower core damage frequencies, longer post-accident coping periods, enhanced resistance to hazards presented by natural phenomena, and potentially reduced emergency preparedness zones or workforce requirements.

These new SMRs, as well as the AP1000 reactors being built at VC Summer and Vogtle, are designed with passive safety features to minimize any requirement for prompt operator action and prevent auxiliary system failures from contributing to future accidents. Passive safety further enhances the safety of nuclear power plants.

Another essential research development on the horizon in FY15 is the planned restart of the Transient Test Reactor (TREAT) at the Idaho National Laboratory to reestablish a domestic transient testing capability. Transient testing will enable the NE R&D programs to understand fuel performance as well as provide a capability to screen advanced fuel concepts, including accident tolerant fuels, which allows for early identification of the limits of fuel performance.

Finally, although this year has brought many exciting developments in new nuclear power construction and technologies, it has unfortunately also been a year of unprecedented nuclear power plant closures. Complex market policy factors and the abundance of natural gas have made operating nuclear power plants uneconomical in some parts of the country, resulting in shutdowns of four nuclear reactors, with another planned for next year. Nuclear power provides over 60% of this country's low-carbon electricity. The shutdown of these power plants is therefore a significant loss of low-carbon electricity. Beyond emissions, these closed nuclear power plants are a considerable loss of baseload electricity supply and a loss of energy diversity. America's nuclear power fleet is a national asset on many fronts, and our programs continue to ensure nuclear remains a key player in America's clean energy future.

The President's fiscal year 2015 budget requests $863.4 million for the Office of Nuclear Energy, a decrease of 2.8 percent (or $25 million) from the FY 2014 enacted budget.

OFFICE OF NUCLEAR ENERGY (NE) PROGRAMS

Supercritical Transformational Electric Power Generation - $27.5 million

Supercritical Carbon Dioxide (SCO2) Brayton cycle energy conversion is a transformative technology that offers significant improvements in energy and environmental performance over the steam-Rankine cycle, which is used for roughly 80% of the world's electricity generation. The higher thermal efficiency of the SCO2 cycle could produce a 40% reduction in fuel consumption and emissions, a 95% reduction in cooling water consumption, or a 60% increase in electricity generation for a constant heat input when used in appropriate applications.

The Supercritical Transformational Electric Power Generation (STEP) project, funded within NE and coordinated among the Offices of Nuclear Energy, Fossil Energy, and Energy Efficiency and Renewable Energy, is a pilot-scale cost-shared demonstration project to accelerate pre-commercial development and validation of advanced of the Supercritical Carbon Dioxide (SCO2) Brayton cycle energy conversion technology. The STEP project is part of a new collaborative effort in the Department of Energy focused on the research, development, and demonstration of supercritical carbon dioxide technologies with the potential for significant improvements in energy and environmental performance over current power generation systems.

SMR Licensing Technical Support - $97 million

The Small Modular Reactor (SMR) Licensing Technical Support program is designed to support first-of-a-kind activities for design certification and licensing activities for SMR designs through cost-shared arrangements with industry partners in order to promote accelerated deployment of these technologies. The acceleration provided by the cost-shared funding is expected to improve U.S. global competitiveness, enhance domestic energy security and contribute to meeting greenhouse gas reduction goals. The program will help demonstrate the potential of nascent SMR technology and encourage new competition in the marketplace.

The Office of Nuclear Energy remains committed to the small modular reactor program and believes strongly in the potential for SMRs to promote American competitiveness, the creation of manufacturing jobs here at home, and the reduction of CO_2 emissions through clean, safe, and reliable nuclear power. The Department's FY15 request, taken in combination with already appropriated funds, can support both the Babcock & Wilcox mPower and NuScale Power projects. The cost-shared technical assistance provided through the SMR program will help enable industry's efforts to obtain certification by the Nuclear Regulatory Commission and ultimately deploy this advanced technology.

Reactor Concepts Research, Development and Demonstration - $100.5 million

The Reactor Concepts Research, Development and Demonstration (RD&D) program is designed to develop new and advanced reactor designs and technologies that advance the state of reactor technology to improve its competitiveness, and help advance nuclear power as a resource capable of meeting the Nation's energy, environmental, and national security needs. Program activities are designed to address technical, cost, safety and security issues associated with advanced reactor technologies such as liquid metal-cooled, liquid salt-cooled, high temperature gas-cooled reactors (HTGRs) and others. Additionally, Reactor Concepts RD&D will conduct research and development on advanced technologies to support life extensions of currently operating Light Water Reactors (LWRs) and address the impacts of the Fukushima accident with a focus on enhancing the accident tolerant characteristics of reactors and their operation.

Light Water Reactor Sustainability - $30.3 million

The existing U.S. nuclear fleet has an excellent safety and performance record and today accounts for about 20% of the U.S. electricity supply and more than 60% of the low greenhouse-gas-emitting, domestic electricity production. The Light Water Reactor sustainability (LWRS) subprogram is focusing research on material aging issues where research results will help support subsequent license renewal applications expected from industry in the 2016 to 2018 time period. Activities in the Reactor Safety Technologies area have been expanded to address lessons learned from the Fukushima Daiichi accident, particularly in understanding and managing Severe Accident (SA) events. These include evaluation of SA instrumentation needs to better monitor and manage SAs, computer analysis of SA progression, and preparation and planning efforts in support of eventual examination of the damaged reactors. The LWRS program has partnered with industry to closely coordinate research needs and share costs. The program also coordinates with the Nuclear Regulatory Commission to improve utility of research results.

Advanced Reactor Technologies - $70.2 million

The Advanced Reactor Technologies (ART) subprogram reflects the consolidation of the Advanced Small Modular Reactor (AdvSMR) R&D and the Advanced Reactor Concepts (ARC) subprograms. This consolidation will allow better integration of R&D activities and use of a portfolio approach with an emphasis on long-term activities and collaborations with industry and international partners. The consolidated program will continue R&D on advanced reactor technologies and will support work on generic topics that can apply to various advanced reactor concepts. This consolidated program focuses on efforts in the following areas: advanced reactor coolants, safety and technology for advanced reactors, advanced energy conversion, advanced instrumentation and controls, support the NRC in its development of an advanced reactor licensing framework, liquid metal reactor component testing, TRISO fuel and graphite material qualification, advanced materials development and codification, continued international collaborations, and industry supporting research. Research results from this program are expected to help reduce design and construction costs, contribute data to the technical bases for the operation of safety systems, improve proliferation resistance, and provide critical insights to help solve key feasibility and performance challenges.

Fuel Cycle Research and Development – $189.1 million

The mission of the Fuel Cycle Research and Development (FCR&D) program is to conduct research and development (R&D) and non-R&D activities related to used nuclear fuel (UNF), nuclear waste management and disposal issues and conduct R&D on advanced sustainable fuel cycle technologies that have the potential to improve resource utilization and energy generation, reduce waste generation, enhance safety, and limit proliferation risk. The program employs a long-term, science-based approach to foster innovative, transformational technology solutions to achieve this mission. Advancements in fuel cycle technologies and solutions support the enhanced availability, affordability, safety, and security of nuclear-generated electricity in the United States.

Material Recovery and Waste Form Development – $35.3 million

The Material Recovery and Waste Form Development subprogram, formerly Separations and Waste Forms, conducts R&D on technologies to improve current fuel cycle performance and advance other fuel cycle technologies with minimal processing, waste generation, and potential for material diversion. In FY 2015, the subprogram is continuing to test the feasibility of a simplified, cost-effective means of separating minor actinides from used nuclear fuels and for capturing off-gases during the separations process. Also in FY 2015, the subprogram will continue its joint fuel cycle studies with the Republic of Korea. In addition, this subprogram also leverages its expertise by working with others in areas such as environmental remediation and national security missions as needed.

Advanced Fuels – $43.1 million

The development of improved and advanced nuclear fuels is a major objective for both existing LWRs and the entire spectrum of advanced nuclear energy systems. The development of advanced fuels is an essential part of future sustainable fuel cycle options. Advanced fuels is pursuing two major paths: 1) the development of next generation LWR fuels with enhanced accident tolerance, and 2) development over the long term of transmutation fuels with enhanced proliferation resistance and resource utilization.

In FY 2015, the program continues feasibility and assessment activities of accident tolerant fuel (ATF) and clad concepts. This includes bench-scale fuel fabrication and testing involving irradiations, steam environments, furnaces, and mechanical property testing. These feasibility and assessment activities also include establishing modeling capability for these new concepts (largely developed from existing models) as well as studies of impacts on economics, the fuel cycle, operations, safety, and the environment.

System Analysis and Integration – $18.5 million

The Systems Analysis and Integration subprogram provides the critical capability needed to analyze complex fuel cycle system options, assess overall performance under various scenarios, and improve understanding of the interdependencies between various subsystems and associated technologies. Systems analysis coupled with the application of the principles of systems engineering will: 1) help the program objectively and openly identify fuel cycle options worthy of further study; 2) aid identification and prioritization of the R&D needed; 3) help formulate and execute program budgets; 4) enable clearer communication of the rationale for R&D funding decisions; and 5) enhance the ability of the program to rapidly adapt to future decisions. Systems analysis and integration provides support in knowledge management, communications, fostering innovation, project controls, and program integration.

Materials Production, Accounting, & Control Technology – $7.6 million

The Materials Protection, Accounting and Control Technology (MPACT) subprogram strives to develop the technologies and analysis tools to support the next generation of nuclear materials management and safeguards for future U.S. nuclear fuel cycles. It also includes assessing vulnerabilities and security of the consolidated storage of used nuclear fuel. Moving forward to address the energy security needs of the country will require innovative approaches to materials control and accounting to ensure that nuclear material is not misused, diverted, or stolen.

The Office of Nuclear Energy works closely with the National Nuclear Security Administration (NNSA), Department of State, and the Nuclear Regulatory Commission (NRC) on issues related to nuclear nonproliferation. NNSA has broad responsibilities in international nonproliferation and security matters for the present and into the future. MPACT is focused on R&D as it relates to potential future fuel cycle facilities here in the United States.

Used Nuclear Fuel Disposition – $79 million

The Used Nuclear Fuel (UNF) R&D subprogram will continue to conduct scientific research and technology development to enable storage, transportation, and disposal of UNF and wastes generated by existing and future fuel cycles. To support the evolution of the domestic UNF inventory, special emphasis is placed on understanding the behavior of high-burnup fuels.

In January 2013, the Administration released its *Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste*. Full implementation of the Strategy's principles and components requires new legislation; however the Department continues to implement elements of the Strategy where possible within existing authorities. The FY 2015 Budget continues funding activities to lay the ground work and develop options for decision makers on the design of an integrated waste management system in alignment with the *Strategy*.

Over the next 10 years the program reflected in the FY 2015 Budget begins operation of a pilot interim storage facility, advances toward the siting and licensing of a larger interim storage facility, and makes demonstrable progress on the siting and characterization of geologic repository sites.

Fuel Resources - $5.6 million

For nuclear energy to remain a sustainable energy source, there must be assurance that an economically viable supply of nuclear fuel is available. The availability of fuel resources for each potential fuel cycle and reactor deployment scenario must be understood. Seawater contains more than 4 billion tons of dissolved uranium. This unconventional uranium resource, combined with a suitable extraction cost, can potentially provide a price cap and ensure centuries of uranium supply even with aggressive world-wide growth in nuclear energy applications.

Nuclear Energy Enabling Technologies - $78.2 million

The Nuclear Energy Enabling Technologies (NEET) program sponsors research and development (R&D) in crosscutting technology areas, such as materials and sensors and instrumentation, and advanced manufacturing, that can inform extended economical operation of the current fleet of light water reactors and enable the development of advanced reactor designs and fuel cycle technologies. This program also makes a strong investment in modeling and simulation efforts to bring 30 years of improved computational and material science to reactor and fuel system simulation. The result will provide researchers, designers, and operators with advanced tools to better understand the behavior of nuclear systems and thereby improve safety and efficiency. These technologies will advance the state of nuclear technology, improving its competitiveness, and promoting continued contribution to meeting our Nation's energy and environmental challenges.

Crosscutting Technology Development - $13.9 million

The Crosscutting Technology Development activities support the Reactor Concepts and Fuel Cycle programs. A balanced science-based R&D approach includes both performance enhancement of evolutionary concepts and investigation of novel concepts, which crosscut two or more reactor concepts or fuel cycles. Incorporating these technologies and capabilities as part of an integrated system offers the potential of revolutionary improvement in safety, performance, reliability, economics, and proliferation risk reduction.

Nuclear Energy Advanced Modeling and Simulation - $21.5 million

NEAMS provides support relevant to both reactor and fuel cycle R&D programs by creating analytic tools, codes and methods for use by scientists and engineers who need to simulate nuclear energy systems. NEAMS is developing a computational ToolKit which is comprised of both reactor and fuel systems analysis capabilities that can be exercised either coupled or independently, depending on the needs of the end user. NEAMS tools are already in use by over 60 organizations domestically and abroad. NEAMS tools today define the state of the art in nuclear simulation.

Energy Innovation Hub For Modeling and Simulation - $24.3 million

The Energy Innovation Hub for Modeling and Simulation (Hub) has been creating a virtual model of an actual Tennessee Valley Authority-owned (TVA), Westinghouse-designed, operating pressurized water reactor (PWR) to simulate its behavior. Engineers will be able to use this virtual model to improve the safety and economics of reactor operations by simulating proposed solutions to reactor power production increases and reactor life and license extensions. The combination of data gained from the virtual model and the physical reactor will be used to resolve technology issues that have long confronted nuclear energy development. The Oak Ridge National Laboratory is currently leading a consortium (CASL – Consortium for Advanced Simulation of Light Water Reactors) of national labs, universities, and industry partners to manage Hub execution.

The FY 2015 budget provides funding for the continuation of the Nuclear Energy Innovation Hub in Modeling and Simulation into a final five year term, assuming the determination is made that the Hub meets all requirements and criteria to be eligible for renewal. The final determination will be completed within fiscal year 2014. If the Hub is renewed, the scope of the final five years will involve completing ongoing activities and extending the capabilities developed by CASL to other types of operating reactors, the next generation of pressurized water reactors that are under construction, and new small modular reactors.

National Scientific User Facility (NSUF) - $18.5 million

The National Scientific User Facility (NSUF) subprogram represents a "prototype laboratory for the future" promoting the use of unique nuclear research facilities for science-based experiments and encourages active university, industry, and laboratory collaboration in relevant nuclear scientific research. The NSUF, through competitive solicitations, provides a mechanism for research organizations to collaborate and conduct experiments and post-experiment analysis at facilities not normally accessible to these organizations.

The Idaho National Laboratory Advanced Test Reactor (ATR) and post-irradiation examination (PIE) facilities at the Center for Advanced Energy Studies and the Materials and Fuels Complex are available as user facilities. In addition, research reactors at Oak Ridge National Laboratory, the Massachusetts Institute of Technology, and North Carolina State University, the Advanced Photon Source beam line capabilities at Argonne National Lab, irradiation experiment design and fabrication capabilities at Pacific Northwest National Laboratory, hot cells and fabrication capabilities at Westinghouse, and examination facilities at the Universities of Wisconsin, Michigan, California-Berkeley, Purdue and Nevada-Las Vegas are partnered with the NSUF, bringing additional user facilities to the research community. Since its designation as a user facility in 2007, NSUF has awarded 72 experiments to 20 universities and 4 laboratories.

Radiological Facilities Management - $5 million

Radiological Facilities Management (RFM) provides support for Radiological Facilities not on DOE property or that do not directly support NE missions. In FY 2015, the Department is requesting funding only for the Research Reactor Infrastructure (RRI) subprogram. RRI supports the continued operation of United States (U.S.) research reactors by providing research reactor fuel services and maintenance of fuel fabrication equipment.

Idaho Facilities Management - $185.9 million

The mission of the Idaho Facilities Management (IFM) program is to manage the planning, acquisition, operation, maintenance, and disposition of the Office of Nuclear Energy (NE)-owned facilities and capabilities at the Idaho National Laboratory (INL). The IFM program maintains Department of Energy (DOE) mission-supporting facilities and capabilities at INL in a safe, compliant status to support the Department's nuclear energy research, testing of naval reactor fuels and reactor core components, and a range of national security technology programs that support the National Nuclear Security Administration (NNSA) and other Federal agencies such as the Department of Homeland Security in the areas of critical infrastructure protection, nuclear nonproliferation, and incident response.

To enable and facilitate R&D activities, strategic priorities for the IFM Program in FY 2015 include maximizing the utility of existing facilities and capabilities through focused sustainment activities and cost-effective rehabilitation. Activities focus on safe and compliant operation of INL's nuclear research reactor and non-reactor research facilities, while conducting corrective and cost-effective preventative maintenance activities necessary to sustain this core infrastructure. In FY 2015, these activities include; 1) restarting the TREAT reactor at the INL to reestablish a domestic transient testing capability. This capability will enable the NE R&D programs to understand fuel performance phenomenology at the milli-second to second time scales as well as provide a capability to screen advanced fuel concepts, including accident tolerant fuels, which allows for early identification of the limits of fuel performance and 2) providing onsite replacement of INL's remote-handled low-level waste disposal capability through the Remote-Handled Low-Level Waste Disposal Project. This capability is needed to support ongoing and future programs (including NE and the Department's Office of Naval Reactors) at INL. This project is funded by NE and Naval Reactors.

In FY 2015, activities associated with the Advanced Test Reactor (ATR) Life Extension Program (LEP) will be complete. Since inception in FY 2005, the LEP Program has successfully completed activities and implemented strategies necessary to ensure the ATR remains viable for the nation's nuclear energy needs. Activities completed as part of the program include seismic analyses and upgrades, nuclear safety design basis analyses and documentation, material condition assessments, identification and procurement of critical spare parts and one-of-a-kind components, and system replacement of critical systems.

Idaho Sitewide Safeguards and Security - $104 million

The Idaho Sitewide Safeguards and Security (S&S) program supports the INL complex nuclear facility infrastructure and enables the Office of Nuclear Energy (NE) to conduct research and development in support of multiple program missions. To better align the S&S funding with INL infrastructure and R&D programs, the S&S program was transferred to the Nuclear Energy appropriation in FY 2014.

The S&S program funds base physical and cyber security activities for the INL, providing protection of the Department of Energy's (DOE) nuclear materials, classified and unclassified matter, government property, personnel and other vital assets from theft, diversion, sabotage, espionage, unauthorized access, compromise, and other hostile acts that may cause adverse impacts on our national security; program continuity; or the health and safety of employees, the public, or the environment.

International Nuclear Energy and Cooperation - $3 million

International Nuclear Energy Cooperation's (INEC) mission is to serve as the Department's overall lead for all international activities related to civil nuclear energy, including analysis, development, and implementation of international civil nuclear energy policy and coordination and integration of the Office of Nuclear Energy's international nuclear technical activities. These activities support international bilateral and multilateral engagement and civil nuclear energy R&D activities with countries with an established or planned civilian nuclear power sector.

Program Direction - $73.1 million

Program Direction provides the Federal staffing resources and associated costs required to provide overall direction and execution of the Office of Nuclear Energy (NE) programs. NE staff is located in Washington, DC, the Idaho Operations Office, Oak Ridge Operations Office and the Nevada Site Office. The Idaho site office funding supports their efforts to continue to be a fully functional service center, not only for the Office of Nuclear Energy, but other Department of Energy offices. Activities within the site office support function include execution of headquarters directed procurements, as well as supplemental support for any unforeseen actions.

In addition to appropriated funds, NE also manages approximately $140 million annually in work for others and reimbursable funding from the National Aeronautics and Space Administration and the Department of Defense for the development of advanced radioisotope power systems for space exploration and national security missions. The Program Direction request reflects NE's continued attempts to optimize support for its Federal workforce, while continuing to improve efficiency and cost-effectiveness and ensure the expert Federal management and oversight of NE mission activities.

Mr. SIMPSON. Dr. Danielson.

Mr. DANIELSON. Mr. Chairman, Ranking Member Kaptur, and distinguished members of the subcommittee, thank you for the opportunity to testify today. The Office of Energy Efficiency and Renewable Energy, known as EERE, seeks to ensure American leadership in the transition to global clean energy economy. EERE's goals are to dramatically reduce U.S. Reliance on oil, reduce energy costs for American families and businesses, create American jobs, and reduce pollution. At EERE, we focus on three distinct energy sectors: Sustainable transportation, renewable power, and energy efficiency. We support research development and demonstration activities with the explicit goal of making clean energy technologies directly competitive without subsidies with the energy technologies in broad use today.

Our Nation stands at a critical point in time with regard to the opportunity in clean energy. Americans continue to spend almost $1 billion a day overseas for foreign oil, and every year we are wasting hundreds of billions of dollars in energy costs through inefficient buildings and factories.

In addition, while $254 billion was invested globally in clean energy in 2013, with trillions more to be invested in the years ahead, the energy industry has systematically underinvested in innovation, investing just 0.4 percent of its sales in R&D.

For these reasons, there continues to be an important and appropriate role for stable, targeted government investment in innovation in the clean energy sector. After decades of EERE support for American clean energy innovation, we are now in the unique position where a wide array of technologies are truly within 5 to 10 years of being cost competitive without subsidies. This presents us not only with the opportunity to address America's strategic energy challenges, but also with one of the most significant economic development opportunities of the 21st century.

We can either make the necessary and appropriate investments to ensure that the clean energy technologies of today and tomorrow are invented and manufactured here in America, or we can surrender global leadership in important new technologies from nations like China, India, South Korea, and Japan.

In fiscal year 2015, EERE is requesting a budget of $2.3 billion from Congress. I would like to briefly highlight recent successes and key proposed activities for fiscal year 2015 from across our portfolio. We will start with our sustainable transportation portfolio. In fiscal year 2015, EERE will seek to build upon an already strong track record in this area. For example, from 1976 to 2008, more than $900 million in EERE supported combustion engine research yielded economic benefits totaling more than $70 billion, a more than 70–to–1 return on investment. And just last year, EERE achieved a high-volume model cost for advanced batteries of $325 per kilowatt hour, a more than 60 percent reduction since 2008.

EERE's fiscal year 2015 supports R&D to advance more efficient combustion engines and increase the use of natural gas and drop in biofuels, and will continue to support R&D to achieve the EV Everywhere Grand Challenge's goal of driving down advanced battery costs to $125 per kilowatt hour by 2022.

We will also continue our focus on driving innovation in fuel cell systems to reduce their costs to $40 per kilowatt by 2020. And we will continue to develop innovative processes to convert cellulosic and algal-based feedstocks to bio-based fuels to demonstrate the technology required to achieve a cost of $3 per gallon by 2017 to 2022.

In our renewable power portfolio, EERE's fiscal year 2015 request will build on our SunShot initiatives 60 percent progress today towards its goal of making solar energy directly cost competitive by 2020. We propose to launch the HydroNEXT initiative to double U.S. Hydropower by 2030, and we will continue to support offshore wind advanced technologies demonstration projects and the Frontier Observatory for research in geothermal energy, an important new site for the comprehensive and synergistic development of cutting-edge new EGS technologies.

Finally, in our energy efficiency portfolio, EERE's fiscal year 2015 request emphasizes cutting edge R&D in next-generation building technologies, like LEDs and high efficiency cooling technologies has increased emphasis on appliance standards and national building energy codes and increased support for next-generation manufacturing R&D to lower energy costs for American manufacturers.

We will support manufacturing R&D facilities to provide small- and medium-sized American manufacturers access to cutting-edge emerging manufacturing technologies that will help them compete globally with continued support for existing facilities, like the manufacturing demonstration facility at Oak Ridge National Lab and our Manufacturing Innovation Institute on additive manufacturing in Youngstown, Ohio, in addition to supporting the launch of at least one new manufacturing innovation institute in fiscal year 2015.

I want to close my prepared remarks today by emphasizing EERE's continued commitment to be a good steward of taxpayer investments. And fiscal year 2014 EERE has taken strong steps to protect taxpayer-funded innovation from being manufactured overseas, requiring negotiated manufacturing commitments in all new funding agreements.

In addition, EERE remains committed to active project management. Over the past 2 years, EERE has uniformly implemented enhanced active project management practices across the board, including exclusive use of cooperative agreements, not grants, and uniform implementation of rigorous annual go/no go project milestones.

In my budget hearing before this subcommittee last year, I noted that from 2005 to March 2013, EERE discontinued more than 50 projects that were not achieving key technical milestones, allowing it to save or redirect more than $113 million. And EERE's new approach appears to be working. Over the past year, EERE has initiated a process of discontinuing more than 17 projects, representing almost $25 million in savings, which is more than double EERE's average annual rate of early project terminations over the last decade.

In closing, I would look forward to continuing to work with this committee to maximize the impact of every taxpayer dollar spent at EERE and to ensure that it is the United States that wins the global race for the clean energy manufacturing industries and jobs of the future.

Thank you, and I look forward to your questions.

Mr. SIMPSON. Thank you.

[The information follows:]

Written Statement of

David Danielson

Assistant Secretary

Office of Energy Efficiency and Renewable Energy

U.S. Department of Energy

Before the

Subcommittee on Energy and Water Development

Committee on Appropriations

United States House of Representatives

Office of Energy Efficiency and Renewable Energy

Fiscal Year 2015 Budget Request to Congress

March 25, 2014

INTRODUCTION

Chairman Simpson, Ranking Member Kaptur, and Members of the Subcommittee, thank you for the opportunity to testify on the President's Fiscal Year 2015 Budget Request for the U.S. Department of Energy's (DOE's) Office of Energy Efficiency and Renewable Energy (EERE).

The Department is pursuing an all-of-the-above approach to developing every source of American energy. EERE leads DOE efforts as the U.S. Government's primary clean energy technology organization—working with some of the Nation's best innovators and businesses to support high-impact applied research, development, and demonstration (RD&D) activities in the three sectors under our purview: sustainable transportation, renewable power, and energy efficiency. With Congress's support, we implement a range of strategies aimed at reducing U.S. reliance on oil, saving American families and businesses money, creating jobs, and reducing pollution. We work to ensure that the clean energy technologies of today and tomorrow are invented and manufactured in America.

Our Nation stands at a critical point in time in terms of the competitive opportunity in clean energy. In 2013, $254 billion was invested globally in clean energy, a 450% increase since 2004—and trillions more will be invested in the years ahead. China recently pulled ahead of the U.S. in clean energy investment after we gained the investment lead in 2011. As the world accelerates into a decades-long transition to clean energy, the United States faces a stark choice: the clean energy technologies of today and tomorrow can be invented and manufactured in America, or we can surrender global leadership and import these technologies from other countries like China, Germany, South Korea, and Japan. We can continue wasting hundreds of billions of dollars in unnecessary energy costs—money that we could reinvest into our economy—or we can strengthen our productivity and competitiveness by investing in more efficient American homes, buildings, and factories.

The United States has world-class innovation capacity, a unique culture of entrepreneurship, well-developed capital markets, and the finest scientists, engineers, and workers in the world. However, despite this tremendous opportunity, the U.S. energy industry is systematically underinvesting in research and development (0.4% of sales versus 12% in aerospace/defense and 20% in pharmaceuticals, according to one estimate).[1] This significant underinvestment in energy research and development by the private sector—in spite of the highly strategic importance of energy to American economic growth, energy security, and the environment—makes government support for applied clean energy RD&D crucial for our future competiveness and economic prosperity.

After four decades of investments in American innovation, a number of EERE-supported technological advancements are, for the first time in our Nation's history, showing a clear path to

---

1 Catalyzing American Ingenuity, 2011.

direct cost competitiveness with conventional forms of energy. Improvements in both cost and performance for an array of clean energy products have brought a number of these technologies to the brink of widespread cost-effective market adoption. For example, through EERE support of industry and laboratory RD&D, wind, solar photovoltaics (PV), LED lighting, and electric vehicles (EVs) have shown remarkable progress with regards to both lower costs and market barriers in recent years.[2] As we build on these successes and continue to invest in energy innovation over the next several years, we have the ability to accelerate the adoption of these technologies, in addition to a number of other clean energy technologies that are on the brink of large-scale market adoption. Now is the time to increase our efforts and continue supporting progress in these areas. Clean energy technologies are real, they are working, and with smart, targeted investments and effective public-private partnerships, they could provide us an opportunity to win one of the most important economic races of the 21st century.

EERE STRATEGIC PRIORITIES AND RETURN ON INVESTMENT

In order to position ourselves to seize this tremendous opportunity, EERE is developing a transparent framework and roadmap of EERE's RD&D strategies and priorities. We will soon release a five-year EERE Strategic Plan for 2014 to 2018 that clearly articulates EERE's vision and mission, our strategic goals and our strategies to achieve them, and the indicators we use to measure our success. The Strategic Plan describes our approach to making programmatic decisions with finite resources across our portfolio's three sectors—sustainable transportation, renewable power, and energy efficiency—and evaluates and projects the impact of our investments in the past and prospectively into the future. We detail the partnerships that make our work possible and how we execute our work in a manner that maximizes our effectiveness and accountability. It is my hope that the EERE Strategic Plan and FY 2015 President's Budget Request will provide this Committee with clear transparency into EERE's strategic priorities and how we effectively manage taxpayer resources to advance U.S. energy and economic goals.

Investment Prioritization

EERE supports members of U.S. industry, research institutions, and academia in innovating, developing, and demonstrating cutting-edge technologies and breaking down market barriers to deploying these technologies. We are committed to supporting RD&D that has a strong potential to transform large existing global energy markets and maximize the return on investment delivered to the taxpayer.

To support the highest-impact activities to achieve our clean energy goals, EERE prioritizes all of its investments according to our "Five Core Questions":

[2] Revolution Now: A Future Arrives for Four Clean Energy Technologies, 2013.

1. *Impact: Is this a high-impact problem?*
   EERE must focus its limited funds on clean energy challenges and solutions that, if successful, will have the highest-possible impact on the energy sector. If successfully developed and fully deployed, the technologies and approaches supported by these investments should make material contributions toward national energy goals—such as petroleum import reductions, greenhouse gas emission reductions, total energy cost reductions, and increased economic growth. Accordingly, EERE will emphasize investments that have the potential to have a greater than 1% impact on national energy metrics if successful.

2. *Additionality: Will EERE funding make a large difference relative to existing funding from other sources, including the private sector?*
   In addition to focusing solely on high-impact opportunities, EERE must also ensure that its investments have a meaningful additional impact relative to ongoing funding from the private sector and other sources. Therefore, EERE should avoid investing in areas where other sources of funding—especially from the private sector—are significant relative to the levels of funding that EERE could provide.

3. *Openness: Are we focusing on the broad problem we are trying to solve and open to new ideas, approaches, and performers?*
   EERE's work is guided by well-developed, long-term roadmaps that are created in collaboration with its key stakeholders. However, in the context of this approach, EERE must create and sustain an internal culture that is always open and receptive to new solutions and partners. Accordingly, EERE must regularly update its roadmaps and provide mechanisms to quickly onboard promising new approaches into its portfolio.

4. *Enduring Economic Impact: How will EERE funding result in enduring economic impact for the United States?*
   As a steward of taxpayer funds, EERE must go the extra mile to develop strategic approaches to ensure that the technologies it supports—if successfully developed and deployed—will result in long-term economic benefits to the country, including growing the U.S. manufacturing base.

5. *Proper Role of Government: Why is this investment a necessary, proper, and unique role of government rather than something best left to the private sector to address?*
   The U.S. private sector is the primary engine that will drive the transition to a national clean energy economy. To maximize its impact, EERE must focus its investments on topics and activities where there is a unique federal role relative to the private sector.

Investment Strategies

EERE works with industry, academia, National Laboratories, and other partners to create technology-specific roadmaps—evaluating the future market potential and public benefits of clean energy technologies by incorporating in-house expertise, market awareness, and knowledge of private investment. Once technology roadmaps and RD&D support strategies are established, EERE investment for these activities falls under three primary areas:

- Early stage research and development to enable **cost reduction and performance improvement**, working to accelerate the development and commercialization of technologies through applied research and development on components or whole technology systems;
- **Technology validation and risk reduction** activities to catalyze the wide-scale adoption of clean energy technologies and solutions by demonstrating the performance of technologies at increasing scales in controlled-laboratory and under real-world conditions, providing benchmarks for performance and durability to provide feedback into our research and development roadmaps, and reducing technology uncertainty to unlock private sector investment; and
- **Reducing market barriers** to the adoption of new technologies that are market ready—such as a lack of reliable information, inconsistent regulatory environments, and workforce training gaps—through activities that include providing best practice information, stakeholder outreach, sustaining and enhancing the clean energy workforce, and providing reliable, objective data.

While EERE strategically plans and evaluates its support of RD&D activities according to these technology roadmaps, we also recognize how dynamic innovators in the clean energy economy constantly integrate new ideas and discoveries to create competitive advantages. The FY 2015 EERE Budget Request includes a small fraction of its annual funding for "Incubator" programs within each of its technology offices. Focusing on technologies and solutions that are not currently significantly represented within EERE's RD&D portfolio and roadmaps, Incubator programs will allow EERE to develop, assess, and screen new "off-roadmap" technologies and solutions for their potential to be "on-ramped" into future program plans, roadmaps, and project portfolios.

Return on Investment

EERE takes its responsibility to deliver return on investment to the U.S. taxpayer very seriously. Accordingly, EERE performs ongoing return-on-investment tracking and analyses for the technologies it supports, which are vital to understanding the impact of the RD&D activities we support. To date, third-party evaluators have completed five evaluations covering EERE's research and development investments in solar photovoltaics, wind energy, geothermal technologies, advanced battery technologies for electric-drive vehicles, and vehicle combustion engines. The results of these evaluations found that, from 1976 to 2008, EERE taxpayer investments of $15 billion in these five areas resulted in an estimated economic benefit to the United States of $388 billion—a net return on investment of more than 24 to 1.[3] To elaborate on one specific example, from 1976 to 2008, EERE-supported combustion engine research investments of $931 million—backed by Congress—yielded a total benefit of $70.2 billion,[4] representing a return on investment of approximately 70 to 1 to the U.S. taxpayer. EERE is proud of this track record of returning value to the American taxpayer and driving and accelerating innovative clean energy technologies to commercial success.

EERE PROGRAMS, ACCOMPLISHMENTS, AND FY 2015 BUDGET REQUEST

In FY 2015, EERE is requesting $2.3 billion from Congress to continue its focus on reducing U.S. reliance on foreign oil, saving American families and businesses money, growing the domestic clean energy industry, creating jobs, and reducing carbon pollution. EERE will also sustain efforts to streamline and enhance its operations, conduct rigorous impact evaluations of its RD&D portfolio, and achieve the greatest possible efficiency and outcomes in each of the three sectors in which it invests and in key EERE-wide cross-cutting initiatives.

Sustainable Transportation Portfolio ($705 Million)

Through its sustainable transportation portfolio, EERE supports research, development, and demonstration work and efforts to break down market barriers for a variety of domestic and cost-effective sustainable transportation technologies. Broadly, the Vehicle, Bioenergy, and Fuel Cell Technologies Offices support two key parallel solution pathways: (1) using less energy to move people and freight and (2) replacing conventional fuels with cost-competitive, domestically produced, sustainable alternative fuels with lower greenhouse gas emissions. Because most petroleum use in the transportation sector occurs in personal vehicles and heavy trucks, EERE's portfolio emphasizes transportation technologies in these areas. EERE's vehicle efficiency focus includes: cost-effective plug-in hybrid, all-electric, and fuel cell electric powertrain components and systems; materials and technologies for lightweight, safe, and efficient vehicle structures; and advanced internal combustion engine technologies.

Sustainable Transportation Accomplishments

EERE-supported technological accomplishments continue to help U.S. families and businesses by reducing fuel costs and providing a range of fuel choices, and by lowering greenhouse gas

[3] Preliminary aggregate net benefits calculation by EERE Office of Strategic Programs, combining cost-benefit impact results from formal evaluation studies conducted for the Solar, Geothermal, Wind, Vehicles, and Advanced Manufacturing Offices.
[4] U.S. DOE, "Retrospective Benefit-Cost Evaluation of U.S DOE Vehicle Combustion R&D Investments: Impacts of a Cluster of Energy Technologies," May 2010. Value in undiscounted, inflation-adjusted 2008 dollars.

emissions. Key EERE accomplishments in the sustainable transportation sector include the following:

- **Reduced fuel costs for heavy duty trucks to help businesses save money.** Through the EERE-supported SuperTruck Initiative, EERE partners have demonstrated a 22% engine efficiency improvement in the laboratory and developed a full-scale, prototype class 8 heavy-duty truck that demonstrated a 61% improvement in freight efficiency during initial on-road testing (compared to a 2009 baseline truck model).

- **Lowered costs of batteries to make plug-in electric vehicles more affordable.** EERE-supported research and development helped reduce the projected high-volume production cost of high-energy, high-power batteries to $325 per kilowatt-hour (kWh) in 2013[5] from $1,000/kWh in 2008, and is on track toward program goals of $300/kWh by 2014 and $125/kWh by 2022—which would enable a range of plug-in electric vehicles to be directly cost competitive with conventional vehicles over the next 5 to 10 years.

- **Reduced cost and improved productivity of biofuel logistics.** In FY 2013, EERE-supported RD&D of five feedstock logistics projects demonstrated a 25% cost reduction for integrated systems that utilize agricultural residues, forest resources, and/or herbaceous and short-rotation energy crops—a $13 per ton cost reduction relative to conventional systems.

- **Dramatically reduced the cost of fuel cell technologies.** In FY 2013, EERE demonstrated technology capable of reducing the high-volume modeled cost of automotive fuel cell systems to $55 per kilowatt (kW), which is a reduction of more than 30% since 2008 and more than 50% since 2006—and is well on the way to achieving the 2020 target of $40/kW.

Program Description and FY 2015 Budget Highlights

Vehicle Technologies: The Vehicle Technologies Office supports research, development, and demonstration (RD&D), as well as efforts to reduce barriers to market introduction, for advanced highway transportation technologies that reduce petroleum consumption and greenhouse gas emissions while meeting or exceeding vehicle performance expectations.

EERE is requesting $359 million in FY 2015 to continue strong RD&D investment in efficient and alternative fuel vehicles. A significant component of the Request, the EV Everywhere Grand Challenge will support aggressive cost reduction and performance improvements in several areas, including in advanced batteries to help reach the goal of cutting modeled high-volume battery costs

---

[5] U.S. DOE, "Linkages of DOE's Energy Storage R&D to Batteries and Ultracapacitors for Hybrid, Plug-in Hybrid and Electric Vehicles," February 2008. Based on high volume manufacturing projection of prototypes that meet or exceed performance requirements using a peer-reviewed cost model, and on proprietary data from battery companies participating in the U.S. Advanced Battery Consortium.

to $125/kWh by 2022 from $325/kWh in 2013, thus making electric vehicles more cost-competitive. FY 2015 funding supports significant research and development of more efficient combustion engine technologies, with the goals of improving passenger fuel economy by 35% and diesel vehicle fuel economy by 50% by 2020 compared to 2009 gasoline vehicles; and improving heavy duty engine efficiency by 30% by 2020, from 42% to 55%. To break down market barriers to alternative fuel vehicles, FY 2015 funding initiates new alternative fuel vehicle community partner projects to demonstrate high-impact replicable models for communities that support deployment of innovative transportation technologies (e.g. compressed natural gas, electric-drive, biofuels, and hydrogen). Finally, the FY 2015 Request supports investment in a new research and development program to address technical barriers associated with compatibility between fuels, engines, and infrastructure, with a focus on natural gas and drop-in biofuels.

Bioenergy Technologies: The Bioenergy Technologies Office supports targeted research, development, and demonstration activities to advance the sustainable, nationwide production of advanced biofuels that will displace a share of petroleum-derived fuels, mitigate climate change, create jobs, and increase energy security.

EERE is requesting $253 million in FY 2015 to support developing advanced biofuels—reducing consumption of petroleum-derived fuels and decreasing emissions through sustainable bioenergy sources. The FY 2015 Request places emphasis on the development of innovative processes to convert cellulosic and algal-based feedstocks to bio-based gasoline, jet, and diesel fuels at a cost of $3 per gallon of gasoline equivalent. EERE will jointly invest with the U.S. Departments of Navy and Agriculture to demonstrate commercial-scale bio-refineries to produce military-specification fuels. Additionally, requested funds will advance innovative technologies from research and development to pilot- and demonstration-scale, supporting EERE's goal of achieving $3 per gasoline gallon equivalent by 2022 with at least 50% greenhouse gas reduction (on a lifecycle basis) with several down-selected technologies in order to provide options and solutions across the Nation. In support of DOE's *Clean Energy Manufacturing Initiative*, FY 2015 funding also enables EERE to help develop technologies to produce high-value bio-chemicals for bio-based carbon fibers, which can be used in the production of lightweight vehicles, wind turbine blades, and novel insulation materials.

***Hydrogen & Fuel Cell Technologies*:** The Fuel Cell Technologies Office develops technologies to enable fuel cells to be cost competitive in diverse applications, especially light-duty vehicles, and to enable renewable hydrogen to be cost competitive with gasoline.

EERE is requesting $93 million in FY 2015 to support RD&D to reduce the cost and increase the durability of fuel cell systems, with a targeted modeled cost of $40/kW and durability of 5,000 hours, equivalent to 150,000 miles, by 2020. EERE's Request supports research and development opportunities for technologies that can bring the cost of hydrogen from renewable resources to less than $4 per gallon of gasoline equivalent, dispensed and untaxed, by 2020. In FY 2015, EERE will also support fuel cell research and development, emphasizing areas such as stack component research and development, systems, and balance of plant components. The Request would help advance hydrogen fuel research and development that focuses on technologies and materials that will reduce hydrogen production, compression, transport, and storage costs. Finally, the Budget Request supports targeted early market fuel cell demonstrations and addresses codes and standards to overcome barriers to commercialization.

Renewable Power Portfolio ($521 Million)

EERE's renewable power portfolio supports developing near-, medium-, and long-term solutions to significantly increase the amount of cost-competitive electric power that is generated from renewable resources across the Nation. The Solar, Geothermal, and Wind and Water Power Technologies Offices help advance technology RD&D to cost-effectively harness the United States' abundant and diverse supply of renewable resources. While each renewable power technology has unique tradeoffs, EERE seeks to enable the development of multiple renewable power technology options for every region of the country, enabling the U.S. to diversify its energy portfolio and better protect our environment and respond to the threat of climate change.

Renewable Power Accomplishments

By supporting renewable power technologies development and demonstration, EERE helps U.S. homes and businesses take advantage of clean, affordable renewable energy. Key EERE accomplishments in the renewable power sector include the following:

- **Supported development of the U.S. offshore wind industry.** In FY 2013, through a 5-year initiative with multiple competitively awarded projects, EERE awardees began preliminary engineering and project development for the first U.S. offshore wind energy projects. In 2014, EERE will down-select and fund three of seven projects to move to final design, construction, and installation. These demonstration projects are anticipated to be operational by the end of 2017—representing an opportunity to leapfrog global competition and advance the creation of a new U.S. energy industry.
- **Enabled the first U.S. grid-connected Enhanced Geothermal System (EGS) project.** In FY 2013, the Desert Peak demonstration project in Nevada completed an 8-month, multi-stage stimulation of an existing well—making it the first grid-connected EGS project in America to generate commercial electricity by providing an additional 1.7 megawatts (MW) at the existing well field.
- **Accelerated the solar industry's technological progress by an estimated 12 years.** EERE's research and development efforts are helping to drive down the costs of solar power. Without EERE involvement, the average solar photovoltaic (PV) module production cost per watt would have been $5.27 in 2008, rather than $1.92, based on a retrospective benefit-cost evaluation

that included a counterfactual assessment.[6] Today, PV modules are sold for less than \$1 per watt.

Program Description and FY 2015 Budget Highlights

Solar Energy: The Solar Energy Technologies Office supports activities targeted at achieving the SunShot Initiative's goal of making solar energy technologies cost competitive with conventional energy sources by 2020.

In this area, EERE is requesting \$282 million in FY 2015 to dramatically lower technology and manufacturing costs of solar power, as well as for activities that break down non-hardware market barriers. Only three years into the 10-year SunShot Initiative, EERE has tracked progress at 60% toward 2020 goals, which include reducing the total installed cost for utility-scale solar electricity to roughly \$0.06/kWh without subsidies. The FY 2015 Budget Request builds on this progress by supporting: development and demonstration of innovative manufacturing technologies to increase U.S. competitiveness (part of DOE's *Clean Energy Manufacturing Initiative*), research and development that enables seamless integration of higher levels of solar penetration into the electricity grid, and solar PV activities that enable a 50% reduction in non-hardware "soft costs." The FY 2015 Request also supports the development of advanced thermal storage and supercritical CO_2 power cycles so that concentrated solar power (CSP) can achieve base-load grid parity and the office's goal of achieving a levelized cost of electricity for CSP of \$0.06/kWh.

Wind Energy: The Wind Energy Technologies Office accelerates U.S. deployment of clean, affordable, and reliable domestic wind power through research, development, and demonstration.

In this area, EERE is requesting \$115 million in FY 2015 to support RD&D on land-based wind power, offshore wind power, and advanced wind turbine manufacturing activities. The FY 2015 Request will enable EERE to support three advanced offshore wind demonstration projects that are planned to be operational by 2017, as well as an "Atmosphere to Electrons" Initiative that is focused on optimizing whole wind farms as a system to lower the cost of land-based and offshore wind energy. In support of DOE's *Clean Energy Manufacturing Initiative*, FY 2015 funding also enables the pursuit of new designs, materials, and manufacturing processes to develop longer blades to capture greater wind resources and to address transportation barriers, all of which support the office's goal of reducing the unsubsidized levelized cost of energy for utility-scale land-based wind energy systems from \$0.074/kWh in 2012 to \$0.057/kWh by 2020 and \$0.042/kWh by 2030.

Water Power: The Water Power Technologies Office supports research, development, and demonstration to accelerate technology development for cost effective and environmentally responsible renewable power generation from water.

---

[6] "Retrospective Benefit -Cost Evaluation of DOE Investment in Photovoltaic Energy Systems," U.S. DOE, August 2010.

EERE is requesting $62.5 million in FY 2015 to support innovative technologies for generating electricity from water resources, including both marine and hydrokinetic (MHK) and hydropower. HydroNEXT, a new EERE initiative, would conduct research and development that supports improvements in the performance, flexibility, and environmental sustainability of technologies applicable to existing hydropower facilities; would support developing and demonstrating technologies that will enable new low-impact fish-friendly hydropower development; and would support EERE's goal of doubling the contribution of hydropower to the U.S. electricity system by 2030 (an additional 300 TWh). The FY 2015 Budget Request also supports MHK activities to develop and validate open-source design tools and support testing of wave and tidal energy systems, which will help enable industry to develop robust next-generation systems. These RD&D efforts would help compress technology development timelines with the goal of reducing the levelized cost of energy for MHK devices to local coastal hurdle rates of $0.12/kWh to $0.15/kWh by 2030.

Geothermal Technologies: The Geothermal Technologies Office accelerates research and development of clean, domestic geothermal energy in order to reduce the risks and costs of bringing geothermal power online.

In this area, EERE is requesting $61.5 million in FY 2015 to support RD&D to drive down the cost of enhanced geothermal systems (EGS), develop other geothermal resources, and support broad geothermal resource analyses. A key element of the FY 2015 Budget Request is for support of site characterization for the Frontier Observatory for Research in Geothermal Energy (FORGE), a critical step toward readying this site to test and validate cutting-edge EGS technologies and techniques. FORGE is a dedicated site focused on creating an accelerated commercial pathway to large-scale EGS power generation in the United States, and supports EERE's goal of demonstrating the capability to create and sustain a 5-MW greenfield EGS reservoir by 2020. The FY 2015 Request would also advance the validation of EERE's "Play Fairway Analysis" to assess exploration risk and the probability of finding new geothermal resources on a regional scale—resulting in maps and studies that help reduce industry's drilling and development risks. Finally, FY 2015 funding will advance DOE's Strategic Materials effort by transitioning its most successful feasibility studies of technologies to extract strategic materials from geothermal brines to technology prototype development or field demonstration projects.

Energy Efficiency Portfolio ($858 Million)

EERE's energy efficiency portfolio seeks to improve the energy efficiency of the Nation's homes, buildings, and industries. The Buildings Technologies, Advanced Manufacturing, Weatherization and Intergovernmental Programs, and Federal Energy Management Program Offices help provide businesses, consumers, and government agencies with innovative, cost-effective energy-saving solutions to improve their energy efficiency—from higher efficiency products, to new ways of designing homes and buildings, to new ways of improving the energy intensity and competitiveness of American manufacturers. EERE's energy efficiency portfolio also supports better integrating the built environment with our energy system to combat costly peaks in energy demand and to increase the capabilities and value of buildings and facilities.

Energy Efficiency Accomplishments

EERE continues to support RD&D that helps U.S. consumers and businesses to save money and advance their energy productivity and global competitiveness. Key EERE accomplishments in the energy efficiency sector include the following:

- **Reduced energy intensity and costs for businesses.** As part of EERE's Better Plants Program, Program Partners representing close to 1,800 plants and about 8% of the total U.S. manufacturing energy footprint have committed to reducing their energy intensity by 25% over 10 years. As of October 2013, Program Partners—including leaders in the steel, automobile, aerospace, and paper industries—have together saved about 190 trillion British thermal units (Btu) and $1 billion since 2009.

- **Increased U.S. manufacturing competitiveness.** EERE has helped manufacturers increase their energy productivity, including providing technical support to 590 combined heat and power (CHP) projects between FY 2009 and FY 2013. Since 1979, EERE-supported RD&D has advanced 220 new manufacturing technologies that increase energy efficiency, and has received 78 R&D 100 Awards.

- **Driving innovation to enable cost savings in residential heating and cooling.** Oak Ridge National Laboratory (ORNL) and a private-sector partner developed a ground source integrated heat pump technology that can save up to 60% of annual energy use and cost for residential heating and cooling over conventional systems, and is up to 30% more efficient than other ground source heat pumps.

- **Provided critical funding for states to weatherize homes.** In FY 2013 alone, EERE helped improve the energy performance and comfort in the homes of 46,871 American low-income families across the Nation, resulting in an estimated 1.4 trillion Btu of first-year energy savings and $20 million in first-year energy cost savings.

Program Description and FY 2015 Budget Highlights

Advanced Manufacturing: The Advanced Manufacturing Office advances RD&D of critical industrial efficiency and clean energy manufacturing technologies, supports shared research facilities tackling cutting-edge, foundational technological challenges, and helps lower market barriers to energy-efficient manufacturing technologies and practices.

EERE is requesting $305 million in FY 2015 to support industrial energy efficiency and to support RD&D of advanced materials and manufacturing processes that cut across multiple EERE technology offices and increase U.S. manufacturing competiveness. The Budget Request would enable EERE to partner with U.S. manufacturers on high-impact research and development focused on advanced manufacturing and materials to realize significant gains in energy productivity, environmental performance, and product yields, with the ultimate goal of assisting U.S. industry in reducing its energy intensity by 2.5% per year.[7] The FY 2015 budget builds on the progress of EERE-supported projects that are already chipping away at this goal, like the development of one flash iron-making process that would help reduce energy consumption up to 20% over historical values. Another project is working to develop an advanced sheet metal forming tool which could reduce scrap metal generation by 70%, reduce energy consumption by 70%, and reduce costs for production by 90%.

The FY 2015 Request supports launching at least one new Clean Energy Manufacturing Innovation Institute, along with continued support of existing institutes, and these efforts will be discussed in more detail below. The Budget Request will also allow EERE to continue to partner with the best and brightest in industry, academia, and at research institutions to address critical manufacturing and supply chain challenges through EERE's advanced manufacturing RD&D facilities. Examples include activities such as the Critical Materials Hub at Ames National Laboratory, comprising over a dozen research universities and industrial partners, that tackles critical materials reduced use, alternatives, and recycling within the clean energy supply chain; and the Manufacturing Demonstration Facility at Oak Ridge National Laboratory.

Finally, FY 2015 funding will allow EERE to continue partnerships with industry in breaking down barriers to commercializing energy-efficient manufacturing technologies and practices, such as CHP, towards a national goal of 40 GW of new cost-effective industrial CHP by 2020.[8]

Building Technologies: The Building Technologies Office supports development and demonstration of advanced building efficiency technologies and practices that support more efficient, affordable, and comfortable U.S. buildings.

EERE is requesting $212 million in FY 2015 to help homes and businesses become more energy efficient, to support energy efficiency innovation, and to work with stakeholders to develop equipment and appliance efficiency standards. The FY 2015 Budget Request supports research and development of several high-impact emerging technologies with the potential to increase United States energy savings and reduce greenhouse gas emissions from residential and commercial buildings. The Budget Request will also allow EERE to partner with home builders in constructing highly energy-efficient homes, and to partner with homeowners in order to improve their access to home energy improvement services. EERE will also partner with the commercial sector to improve

[7] EPACT 2005.
[8] E.O.13624.

the information, tools, and resources available for commercial buildings to reduce energy consumption and meet the goal of 20% energy savings in commercial buildings by 2020. The FY 2015 Request supports a consortium for building energy innovation to reduce energy use in small- and medium-size commercial buildings and demonstrate new market pathways for energy savings. Finally, the Request enables equipment and appliance standards that establish minimum efficiency requirements pursuant to federal statutes, towards the goal of reducing building source energy use and reducing carbon pollution by at least 3 billion metric tons cumulatively by 2030.

Weatherization and Intergovernmental Program: The Weatherization and Intergovernmental Programs Office partners with state and local organizations in order to make clean energy technologies more accessible to a wide range of government, community, and business stakeholders.

EERE is requesting $305 million in FY 2015 to support weatherization, state energy activities, and clean energy and economic development technical assistance. EERE's FY 2015 Budget Request in this area includes $228 million to support the Weatherization Assistance Program at levels that provide access to home weatherization services for more than 33,000 low-income households in jurisdictions across the country. The FY 2015 Budget Request also contains increased funding to enable EERE to support and expand innovative initiatives with its State Energy Office network in order to spur accelerated deployment of energy efficiency and clean energy technologies. These engagements include reducing state government energy use, with a goal of reducing state government facilities and operations energy use by 2% per year through 2020, and accelerating investment in state and local public-sector use of energy service performance contracting by $1 to $2 billion by 2016. Finally, the Budget Request will support Clean Energy and Economic Development Partnerships to assist regions in creating economic development roadmaps in sustainable shale gas growth zones and also to provide technical assistance to enable local governments and communities to leverage clean energy technologies to achieve local economic growth.

Federal Energy Management Program: The Federal Energy Management Program works across the federal government to provide individual federal agencies with technical expertise that enables the federal sector to lead by example and meet energy efficiency and clean energy goals.

In this area, EERE is requesting $36 million in FY 2015 to continue its progress in assisting the U.S. Government meet core energy efficiency, water conservation, and renewable energy utilization goals for government buildings. The FY 2015 Budget Request supports a center of expertise focused on Federal Data Center Energy Efficiency and Optimization, increased project tracking, and expanded development and implementation of critical tools for enhancing the effective use of project financing mechanisms. Through the continuation of the Federal Energy Efficiency Fund, EERE's Request would provide funding to leverage cost-sharing at federal agencies for capital projects, as well as other initiatives, that support government-wide goals to reduce federal facility energy intensity by 30% by the end of FY 2015 compared to FY 2003, reduce water consumption intensity by 16% by the end of FY 2015 relative to a 2007 baseline, and utilize renewable electric energy equivalent to at least 7.5% of total electricity use by FY 2013 and 20% by 2020.

EERE CROSS-CUTTING INTIATIVES

In addition to EERE's technology offices, we also work to break down silos across DOE and EERE offices to address critical, crosscutting energy initiatives that broadly impact our clean energy goals. Within our technology office budgets, EERE organizes and coordinates investments across our technology sectors around addressing common key themes to achieve maximum impact for the U.S. taxpayer.

Grid Integration Initiative

One of EERE's primary missions has been to drive down the costs of individual technologies related to energy efficiency, renewable power, and sustainable transportation. As these programs have become increasingly successful at driving down the cost of emerging technologies, more and more of these technologies are being integrated into the electrical power system. However, as these technologies are deployed in greater numbers, they introduce new challenges associated with the physical operation of the grid.

EERE's *Grid Integration Initiative*—in coordination with the Office of Electricity Delivery & Energy Reliability and other DOE offices—organizes activities across EERE's technology offices to holistically enable the seamless integration of EERE technologies into the electrical grid in a safe, reliable, and cost-effective manner. In FY 2015, EERE is requesting $126 million for this Initiative across our Buildings, Solar, Vehicles, Wind, Water, Fuel Cells Technology, and Advanced Manufacturing Offices. This amount also includes an increased investment of $30 million in base funding for the new Energy Systems Integration Facility (ESIF) at DOE's National Renewable Energy Laboratory to support full operation of the user facility.

Commissioned in September 2013, ESIF is a state-of-the-art facility designed for testing, simulation, data analysis, engineering, and evaluation techniques for integrated technologies in a risk-free environment. ESIF serves as the focal point for EERE grid integration activities and is providing unique research and development opportunities for utilities, advanced clean energy technology manufacturers, and system integrators that together will help reshape the energy system of the 21st century. This exceptional national resource supports scientists and engineers from the private and public sectors conducting critical research, development, testing, and validation. The efforts at ESIF will directly benefit and inform equipment providers, utilities, public utility commissions, legislative bodies, and other entities working to integrate renewable energy and advanced efficiency technologies and approaches into the Nation's electricity grid.

ADVANCING U.S. MANUFACTURING COMPETITIVENESS

One of EERE's continued areas of strong emphasis across our technology offices—and one that I know is of great importance to this Committee as well as to the Administration—is supporting U.S. manufacturing competitiveness.

EERE recognizes the many benefits of U.S.-based manufacturing within the clean energy economy—including job creation and high-tech intellectual property generation—and leads the Department of Energy's *Clean Energy Manufacturing Initiative* (CEMI). CEMI is a comprehensive and coordinated DOE-wide effort created to increase U.S. competitiveness in clean energy manufacturing. CEMI supports the dual objectives of 1) increasing U.S. manufacturing competitiveness in the production of clean energy products and 2) boosting U.S. manufacturing competitiveness across the board by increasing energy productivity. In FY 2015, EERE is requesting $554 million for CEMI activities across our Advanced Manufacturing, Vehicles, Bioenergy, Solar, Wind and Water, Buildings, and Fuel Cell Technology Offices to increase the energy efficiency, productivity, and competitiveness of U.S. manufacturing.

Consistent with the President's vision for an interagency National Network for Manufacturing Innovation (NNMI), the FY 2015 CEMI Request continues support for crosscutting Clean Energy Manufacturing Innovation Institutes. These EERE-led Institutes are public-private partnerships focusing on RD&D of foundational technologies that are broadly applicable and pervasive in multiple industries and markets, and that have potentially transformational technical and manufacturing productivity impacts.

In January 2014, EERE announced the Next Generation Power Electronics Manufacturing Institute. The institute will bring together over 25 companies, universities, and state and federal organizations to invent and to develop the manufacturing processes for wide bandgap (WBG) semiconductor-based power electronics that are cost-competitive and significantly more efficient at high powers and temperatures than current silicon-based technology on the market—leading to more affordable products for businesses and consumers, billions of dollars in energy savings and high-quality U.S. manufacturing jobs.

In February 2014, EERE announced a new competition to establish an Advanced Composites Manufacturing Innovation Institute to develop high-speed and energy-efficient manufacturing and recycling processes that lower the cost and the amount of energy used to produce advanced fiber-reinforced polymer composites for clean energy applications. Advanced composites could help manufacturers deliver clean energy products with better performance and lower costs such as lightweight vehicles with record-breaking fuel economy; lighter and longer wind turbines blades; high pressure tanks for natural gas- and hydrogen-fueled cars; and lighter, highly energy-efficient industrial equipment.

As part of the Department's *Clean Energy Manufacturing Initiative*, these Institutes will accelerate growth of and innovation in domestic clean energy products, and spur the creation of high-quality, high-paying U.S. manufacturing jobs.

CEMI both leverages and complements the new Institutes' efforts to develop and transition these foundational technologies into the commercial clean energy marketplace by coordinating and optimizing all research, development, and demonstration of WBG and advanced composites technology through two focused initiatives crosscutting our Technology Offices. In FY 2015, EERE will coordinate through the *Next Generation Power Electronics Initiative*—across the Vehicles and Advanced Manufacturing Technology Offices—to maintain U.S. leadership in WBG semiconductor technology by creating a U.S. manufacturing and research and development base for WBG power devices and power electronics systems. EERE will also coordinate through the *Carbon Fiber Composites for Clean Energy Initiative*—across the Vehicles, Bioenergy, Fuel Cells, Wind, and Advanced Manufacturing Technology Offices—to optimize RD&D investments across EERE to address challenges throughout the entire supply chain for carbon fiber composites.

In addition, EERE has made progress in how it treats intellectual property utilization for companies and universities receiving taxpayer resources for RD&D projects. Mindful of the objectives of related legislation, such as the Patent and Trademark Law Amendments Act ("Bayh-Dole"), EERE's efforts will help to advance innovation, commercialization, and manufacturing of clean energy technologies within the United States. Motivated in part by this Committee's report language, starting in FY 2014, EERE has successfully built into its standard operating procedures 1) the requirement that applicants to EERE competitive Funding Opportunity Announcements submit U.S. manufacturing plans—or agree that subject inventions be substantially manufactured in the U.S.—as a component of their applications; 2) the requirement that, where appropriate, EERE consider U.S. manufacturing plans when evaluating applications; and 3) the requirement that, where appropriate, EERE negotiate, track, and enforce U.S. manufacturing commitments as part of its cooperative agreements. These efforts will help foster U.S. innovation, strengthen manufacturing competitiveness, and provide our research partners the assurance that EERE is dedicated to leveraging the clean energy economy's competitive opportunity for the U.S.

EERE OPERATIONAL EXCELLENCE AND ORGANIZATIONAL IMPROVEMENTS

In FY 2015, EERE will maintain its strong focus on operational excellence. Building on early progress of recently initiated, multi-year comprehensive organizational reforms, EERE will conduct our work with greater speed, quality, and higher-impact results year by year.

Ensuring Program Planning, Prioritization, and Review Are Clear and Transparent

EERE will continue to articulate and communicate its future plans and program priorities, both internally and externally, through updates to our EERE Strategic Plan and to EERE technology office Multi-Year Program Plans (MYPPs). Specifically, MYPP activities and priorities will flow from the EERE Strategic Plan and will describe, in greater detail, the goals, program thrusts, roadmaps, and prioritization methodologies that drive them. Furthermore, office MYPPs are informed by extensive stakeholder engagement, such as through regular external expert peer reviews of our portfolios. By ensuring a process of regular updates to major plans and engaging in rigorous dialogue with experts and other stakeholders, EERE will responsively move into new and highly promising program areas, and we will terminate programmatic thrusts that are deemed to no longer be highly relevant or impactful.

Conducting Program Impact Evaluation and Tracking for a Majority of EERE's Portfolio

To inform EERE program planning and enable high-impact returns on investment to the U.S. taxpayer, EERE plans to perform a broader range of regular and rigorous impact evaluations. At the same time, EERE has taken steps to improve processes that establish, track, and aggregate project-level impact metrics, enabling a consistent methodology for analyzing and reporting on these metrics over the next several years. EERE's approach will increasingly involve quantifying and evaluating its contributions to creating knowledge, engineering solutions, validating new technologies, and accelerating the development of next-generation technologies. EERE will use these quantitative evaluations to inform its decision-making processes, expand or replicate highly effective activities, and curtail or eliminate ineffective investments.

Enhancing EERE's Stewardship of Project Portfolios through Active Management Approaches

In order to be an effective steward of taxpayer dollars and produce the highest impact from its investments, EERE is moving aggressively in implementing Active Project Management, inspired by Advanced Research Projects Agency–Energy's (ARPA-E) rigorous project management efforts. EERE has developed, and is beginning to execute, approaches that provide clearer accountability through:

- More clearly defined roles and responsibilities in project execution by establishing uniform position requirements across the organization;
- Enhanced project management standard operating procedures;
- Guidance to more effectively negotiate detailed statements of project objectives for each project, including quarterly progress reviews and annual "Go/No-Go" milestones; and
- End-of-project deliverables clearly oriented around accomplishments that can impact the energy marketplace.

By implementing rigorous Active Project Management principles, since March 2013, EERE has started the process of discontinuing approximately 17 projects due to performers not meeting technical requirements. This builds on EERE's commitment to be a good steward of taxpayer dollars. As I identified during my last budget hearing in front of this Committee, between FY 2005 and March 2013, EERE discontinued approximately 50 underperforming projects totaling about $113.3 million.

Forward Funding to Buy Down Mortgages

EERE continues to be responsive to this Committee's request to shift to forward funding of multi-year commitments wherever possible. In doing so, EERE continues to minimize the exposure of taxpayers to future mortgages in situations where the funding has yet to be appropriated, and remains highly responsive to the changing dynamics of the clean energy landscape. We have made significant progress towards this goal to date. By the start of FY 2014, EERE paid down mortgages totaling over $400 million since FY 2012. In FY 2014, we estimate paying down approximately $194 million more in mortgages. EERE remains committed to forward funding all projects it supports to the greatest extent possible, and looks forward to an open conversation with this Committee in the future on how to maximize the opportunity of clean energy for American families and businesses while also remaining an active steward of taxpayer resources.

CONCLUSION

In conclusion, allow me to reiterate the key points that I want to leave you with today. At EERE, we recognize the enormous opportunity that clean energy represents for the United States. Working in partnership with the private sector, we are optimistic that we can create and sustain American leadership in the global transition to clean energy, and in so doing grow high-paying jobs and strong market share for our workers and businesses. We stand behind EERE's track record of accomplishments and our efforts to make our organization even more effective and accountable to you and to the American taxpayer as we pursue our mission. We are privileged to play this role and to work with this Committee to help ensure that the United States wins the global clean energy race.

Mr. SIMPSON. Ms. Hoffman.

Ms. HOFFMAN. Good morning, Mr. Chairman, members of the committee. Thank you for the opportunity to appear before you today to discuss the President's fiscal year 2015 budget for the Department's Office of Electricity Delivery and Energy Reliability. OE's mission is to lead national efforts to modernize the electric grid and enhance the security and reliability of our Nation's energy infrastructure as well as facilitate recovery from disruptions to the energy supply.

A modern grid is vital to the Nation's economy and security. It provides a foundation for critical services that Americans rely on every day. This is especially true now. America's energy landscape is being redefined. Power outages resulting from extreme weather events, such as Superstorm Sandy, are disrupting lives and costing billions of dollars. A resilient energy infrastructure that can recover quickly from a severe weather event is critical. While climate change is a significant risk to the resiliency of the energy system, there are other risks as well. Manmade threats, such as the physical attack on the Metcalf electric substation in California, are evolving.

Cybersecurity for the energy sector is now one of the Nation's most serious grid modernization and infrastructure protection issue. The infrastructure itself is aging. Technology is also changing rapidly, as are customers' expectations and the demands for energy. We are at a pivotal point. The Nation's grid must evolve and adapt to these changes and to those we can't yet see.

The fiscal year 2015 budget request for OE is $180 million and affirms the Administration's commitment to modernizing the Nation's electricity system. OE takes a broad, multi-dimensional approach that spans the breadth of issues necessary to ensure a reliable, secure, and resilient system one that is flexible enough to accommodate all types of generation—consistent with the Administration's "all-of-the-above" strategy. From operational support during energy emergencies to technical assistance with policy and regulatory issues, to deployment of advanced solutions in the near term as well as advanced technologies in the long-term, OE's activity focuses on complex issues and opportunities in a rapidly changing energy landscape. Given the challenges that we face, the request reflects an urgent need for building in resiliency to strengthen our ability to help secure the U.S. energy infrastructure against all types of hazards and respond and reduce the impact of disruptive events.

The request of $22.6 million for the Infrastructure Security and Energy Restoration Program includes funds for enhanced emergency response and restoration capabilities. As part of our all-hazards approach to the protection of critical infrastructure, the request also includes 42 million in support of our efforts to address cybersecurity threats. We are accelerating innovative research and development for the long term while addressing the immediate need for information sharing with the energy sector and mitigating cybersecurity events as well as advanced capabilities.

To better understand the potential impacts to the energy infrastructure in the near term and long term, we are working on improvements that will advance resiliency and security. With the request of $36 million for the Clean Energy Transmission and Reliability Program these investments will allow us to build an energy system analytical capability that will include criticality and risk analysis, interdependency, and support for emergency events.

We are also investing in research in modeling and computational mathematical advancements that will turn the real-time synchrophasor data into actionable information which will allow grid operators not only to understand what is currently happening, but also what could happen.

The request of $24 million for our Smart Grid program expands our investments in the transformation of the grid at the distribution level through the development of innovative technology and concepts.

Energy storage is also critical to the reliability and resilience of the system, enabling a greater adoption of renewable energy resources and more effective utilization of the existing system. The request of $19 million for energy storage focuses on and addresses challenges related to cost reduction, system engineering, and performance improvement, as well as increased emphasis on safety and reliability of energy storage.

In conclusion, we are living in a time that demands a broad perspective and that considers the urgent needs of today and anticipates the future. The fiscal year 2015 budget request invests in activities that will allow us to address some of the ongoing challenges of modernizing the Nation's electric grid and continues moving us towards a more resilient and secure energy future.

This is my statement. Thank you, Mr. Chairman.

Mr. SIMPSON. Thank you.

[The information follows:]

Statement Of
Patricia Hoffman
Assistant Secretary
For Electricity Delivery and Energy Reliability
U.S. Department of Energy
Before The
United States House of Representatives
Appropriations Subcommittee on
Energy and Water Development
March 25, 2014

Mr. Chairman and Members of the Committee, thank you for the opportunity to appear before you today to discuss the President's Fiscal Year (FY) 2015 budget for the Department of Energy's (DOE) Office of Electricity Delivery and Energy Reliability (OE).

It is the mission of this office to lead national efforts to modernize the electricity delivery system, enhance the security and reliability of America's energy infrastructure and facilitate recovery from disruptions to the energy supply. A modern electricity grid is vital to the Nation's security and economy, providing the foundation for critical services that Americans rely on every day. Electricity is woven into nearly every modern activity. At any given moment, millions of people expect to be able to flip a switch, turn on the water, get money out of an ATM, pump gas into their cars, or do any of the countless activities that make up modern daily life – all without having to think about whether or not they have electricity.

Modernizing the Nation's aging energy infrastructure is a complex challenge. OE's FY 2015 budget request makes critical investments that support the Administration's all-of-the-above energy strategy. In addition to investing in applied research and development to develop advanced tools, analysis, and techniques, OE also helps states in their efforts to improve their policies and state laws to enhance the capabilities of the system in the following ways:

- *Reliability* – high-quality, consistent power flow;
- *Flexibility* – the ability to adapt to changing supply and demand patterns;
- *Efficiency* – delivery of electricity with reduced losses and greater asset utilization rates;
- *Cost Effectiveness* – optimization of technologies and systems to minimize cost; and
- *Resiliency* – the ability to withstand and recover more quickly from disruptions, and maintain critical functions.

Improvements to all five of these operational capabilities, together with end-to-end security from both manmade and natural threats, are necessary for a modern and reliable grid. To achieve energy security for the Nation, we must have a secure grid. Recognizing that security for energy delivery systems is most effective when it is built into the system from the very beginning, OE has worked closely with the electricity sector for over a decade to improve protection and resiliency of the grid.

With the growing dependence of our economy on electricity and the economic and personal losses from electricity outages due to severe weather becoming greater each year, building in resiliency has assumed an even greater degree of urgency. Power outages resulting from extreme weather events disrupt lives and cost the economy billions of dollars. Eight of the top 10 hurricanes in terms of damage and economic loss have occurred over the last decade. In 2012, there were 11 different weather disaster events each with estimated losses of $1 billion or more across the U.S. The impact of events such as Superstorm Sandy, the vulnerabilities of our communities, and the critical importance of coordinated preparation, response and recovery become increasingly clear.

Preparing the Nation for the impacts of climate change is a top priority for this Administration. The President's Climate Action Plan offers a strategy for steady, responsible actions, including building stronger and safer communities and infrastructure that can adapt to climate change and recover from severe weather events more quickly. A resilient energy infrastructure that can recover quickly from a severe weather event is critical for climate adaptation.

As you can see in our FY 2015 budget request, we have a notable increase to expand the Operational Energy and Resilience program that will include the construction of the Energy Resilience and Operations Center. Being able to respond quickly and effectively to situations such as this winter's storms and the propane and heating fuel shortages that affected 34 states is critical.

OE's budget request for FY 2015 further broadens our capabilities to protect against and mitigate cyber threats to the energy infrastructure. Cybersecurity for the energy sector has emerged as one of the Nation's most serious grid modernization and infrastructure protection issues. Intelligence reports indicate that cyber adversaries are becoming increasingly targeted, sophisticated, and better financed. Cybersecurity practices must address not only the threats and vulnerabilities of traditional information systems, but also issues unique to electric grid technology. Adapting to the changing cyber landscape is critical as the threat of attack grows.

Climate change and an evolving cyber threat are not the only kinds of change that are redefining the energy landscape. The electric grid itself and the technologies, tools and techniques associated with the system are also rapidly changing to accommodate change in the world – from growing deployments of renewable and distributed energy resources to the greater adoption of advanced communications and control technologies that can better respond to system disturbances, reduce systems losses, and help customers better manage their electricity use. At the same time, we are becoming even more dependent on electricity as our society becomes more connected and digitized.

The American Recovery and Reinvestment Act of 2009 invested $4.5 billion to begin the large task of modernizing America's aging electricity infrastructure. This was an important step in accelerating the Nation's transition to a smarter, stronger, and more efficient and reliable electric system. The Recovery Act funding has enabled the deployment of millions of smart grid technologies including phasor measurement units, smart relays, automated feeder switches, smart meters, and distribution management systems. These technologies are now being used across the country to improve the grid's ability to absorb disruptions while maintaining critical functions and quickly return to normal operations. They have also created and shaped new markets and opportunities: utilities use the data from smart meters to better target system maintenance, and entrepreneurs are building businesses based on using these data to better serve customers' needs.

OE's FY 2015 budget request invests in activities that build on the successes of the Recovery Act-funded technology deployments, help communities become more resilient to extreme weather events, and help anticipate the growing challenges and changing dynamics in which the energy system will operate. The Smart Grid program will also invest in the development of the next generation of high performance smart grid – a concept that we refer to as "Smart Grid 2.0".

To further support our resiliency work, we are developing a capability to predict the impact of energy system disruptions, thus improving our ability to prepare for and respond to extreme weather and other threats to the system.

OE's FY 2015 budget request prioritizes activities that increase the resiliency, reliability and security of the Nation's power grid by taking a systems-level approach to grid modernization, developing the computational capabilities to improve system planning and operations, and emphasizing the security of both new technologies and legacy energy systems.

HIGHLIGHTS OF THE FY 2015 REQUEST

At $180 million, the FY 2015 budget request reflects a 22 percent increase from the FY 2014 appropriation, demonstrating the priority the Department places on OE's role in strengthening the energy infrastructure and modernizing the grid. It emphasizes investments that increase the resiliency of the electric grid, including managing risks, increasing system flexibility and robustness, enhancing visualization and situational awareness, deploying advanced control capabilities, and microgrids. These priorities are reflected in the following highlights.

Developing an Enhanced Capability for Emergency Response and Restoration: The Infrastructure Security and Energy Restoration (ISER) program has the most significant increase in OE's budget request, with a request of $22.6 million, a $14.6 million increase over FY 2014. ISER helps secure the U.S. energy infrastructure against all types of hazards – both natural and man-made – and responds to and reduces the impact of disruptive events, assisting in quickly restoring energy when events occur. The increasing complexity and interdependency of national energy infrastructure – in conjunction with natural disasters, threats from aging infrastructure, human error, potential high-impact low-frequency threats such as geomagnetic disturbance storms or a catastrophic earthquake, and deliberate attacks – represent significant challenges for the energy sector. In carrying out the Department's role as the Sector-Specific Agency for Energy, OE is responsible for collaborating with Federal, state and local governments and the private sector, facilitating the assessment of the sector and encouraging risk management strategies to protect against and mitigate impacts on the energy sector.

Reflecting the sharp increase in the frequency and intensity of extreme weather events such as Superstorm Sandy and from man-made events such as the recent spate of physical attacks on the grid, the FY 2015 request continues the commitment to develop an enhanced capability through the Operational Energy and Resilience (OER) initiative. Begun in FY 2014, the OER will allow the Department to better protect against and mitigate these threats and hazards, with the ultimate goal of quicker recovery by industry and the communities they serve. The FY 2015 request funds for the construction of the Energy Resilience and Operations Center (E-ROC) where OE will monitor, receive and analyze real-time threat and energy sector status, and disseminate information to the appropriate stakeholders. During emergencies, E-ROC will serve as the collaboration hub between the Department, other Federal Agencies, and energy sector partners. The request also provides for hiring 17 additional Federal staff, with one energy advisor within each of the 10 FEMA regions to develop regionally-based solutions and support preparedness and response, as well as seven technical staff for E-ROC. The expansion of situational awareness tools and real-time visualization capabilities, begun in FY 2014, continues in FY 2015.

Strengthening cybersecurity in the energy infrastructure: Strengthening protection of the critical energy infrastructure against an increasingly active and sophisticated threat of cyber attack is vital to the Nation's energy and economic security. As the energy sector-specific agency, OE has the mission, the expertise, and the relationships to work with industry to mitigate the risks the electricity and oil and natural gas sectors face, and to strengthen the cybersecurity of critical energy infrastructure against current and future threats.

There are a number of challenges unique to energy system cybersecurity, including protecting legacy devices that were installed before cyber threats existed. Another challenge is that most cybersecurity solutions are developed for IT systems, which have important differences from systems that control real-time energy delivery. Cybersecurity solutions for the energy sector are imperative, and it is just as imperative that these solutions not interfere with the critical function of the energy delivery device they are meant to protect.

OE has adopted a strategic approach that is strengthening Energy Sector cybersecurity through sustained action on multiple fronts. We are accelerating innovative research and development today and over the longer term, while we are addressing the immediate need for information sharing and response capabilities. The FY 2015 budget request for the Cybersecurity for Energy Delivery Systems (CEDS) program provides $42 million to expand and accelerate our efforts to address cybersecurity challenges. Our work aligns with the *Roadmap for Energy Delivery Control Systems Cybersecurity*, a strategic framework developed in collaboration with the energy sector.

Our focus in FY 2015 falls into several areas. We will continue investing in research to develop cutting-edge cybersecurity technologies and tools, working with the energy sector, which is fundamental to our continued success in transitioning research into practice. Some examples of innovations available and in use today include technology that protects energy delivery computers from unexpected cyber activity, and cybersecurity gateways that protect communications of field devices and between control centers.

Within the CEDS program, we are also increasing our efforts to help the energy sector improve its cybersecurity posture at the organizational and process levels through expansion of tools such as the Cybersecurity Capability Maturity Model (C2M2). The C2M2, which was launched in 2012 as part of an Administration initiative led by the Energy Department and developed with the Department of Homeland Security, industry and other stakeholders, helps organizations measure and improve their cyber capabilities, informs their cybersecurity investment decisions, and encourages the adoption of best practices. The electricity sector tool has been requested by over 230 organizations including more than 100 utilities. In FY 2014, the C2M2 model was adapted and released for use by the oil and natural gas industry as well.

In FY 2015, we will increase our efforts to enable timely sharing of cyber threat information within the electric sector to enhance its ability to identify and analyze threat data and to coordinate protection of critical infrastructure. OE will continue expanding a pilot application, the Cybersecurity Risk Information Sharing Program (CRISP), to include ten additional electric subsector entities as well as five oil and gas subsector entities to the network in FY 2015.

The FY 2015 request also supports OE's leadership role to strengthen and refine the Energy Sector's cyber incident response capabilities. Through the Energy Sector-Cybersecurity Incident Management Capability effort, OE and its Federal and private sector partners are working to build effective, timely, and coordinated cyber incident management capabilities for operations, information exchange, and technology in the energy sector. OE is leveraging governmental and non-governmental resources to create a suite of deliverables toward this end, including blueprints, playbooks, and a five-year roadmap.

Strengthening reliability, resiliency, and efficiency in the electricity distribution system: This is a pivotal moment, with the distribution system facing many changes that present both opportunities and challenges. Advanced information and communication technologies are opening up opportunities for utilities to leverage huge volumes of data for improved operational efficiency and integration of all distribution system assets in ways that were never before possible. Simultaneously, falling costs of distributed energy resources, electric vehicles, and demand-side management technologies mean that utility distribution systems must accommodate increased deployment of these technologies. That, in turn, is creating greater operational complexity. Consumers also now expect more in terms of controlling and managing their energy use – yet another complication for utility operations.

Transforming the way in which electricity is distributed by developing new tools, technologies and approaches will help improve the reliability, resiliency, and efficiency of the grid, and can help to manage electricity costs. Advanced distribution systems that use microgrids and other distribution control strategies to enhance operational response and system recovery will be crucial to next-generation electric distribution systems that support a 21st century economy and society.

The FY 2015 request of $24.4 million for our *Smart Grid* program expands our investment in transforming electric distribution systems through the development of new tools, innovative grid technologies, and advanced concepts.

One area of priority for FY 2015 is microgrids which are localized grids that can disconnect from the traditional grid to operate autonomously and help mitigate grid disturbances to strengthen grid resilience. We saw the important role microgrids can play in resiliency during Superstorm Sandy, when hospital, university, and building facilities equipped with microgrids were able to provide essential power to critical loads during week-long grid outages. Our work with microgrids in FY 2015 will broaden to include increasing partnerships with more states in microgrid design and implementation, transferring a prototype Microgrid Design Toolset for use by community energy assurance planners, advancing the challenge competition to meet a higher performance standard, developing direct current (DC) microgrids for climate-neutral buildings, and continuing work by our national laboratories to develop microgrids for fast restoration and recovery during grid outages.

Another priority is to invest in supporting the move towards the next generation of higher performance smart grid which we refer to as "Smart Grid 2.0". Capitalizing on the recent surge in advanced technology deployments and the growth of "big data" will result in being able to leverage change such that the new processes and structures needed to operate the grid in the future do not create obstacles but rather promote the creation of smarter, cleaner, more resilient distribution systems. OE will focus on the development of new, more advanced distribution control systems that integrate multiple applications common within the utility environment and address such conditions as weather, power flow, asset conditions, and available grid and customer resources. Addressing and accounting for a wider range of interrelated dynamic conditions will allow for localized supply and demand balancing to increase the stability of the entire system.

Expanding analytical and predictive capabilities of energy systems impacts: The FY 2015 request increases investment in the Energy Systems Predictive Capability (ESPC) program to $7 million. This is a $3 million increase from FY 2014, which was the program's first year as a distinct program in OE's budget. ESPC is building a core capability for energy system analysis that supports DOE decision makers and provides key energy system risk information to Federal and state partners, and the energy system owners and operators. The capabilities include criticality and risk analysis, interdependency analysis, and support for emergency events. A predictive capability to better understand potential impacts to energy infrastructure will help in near- and long-term planning and response, motivate infrastructure improvements to improve resilience and security, and reduce vulnerabilities. In FY 2015, ESPC activities build on initial investments made in FY 2014 and could include an assessment of winter weather risks to transportation and heating fuels, electricity supplies and energy markets. Criticality analysis may be extended to include assessing supply chain vulnerabilities for key electricity transmission system components. Together, these predictive products will feed into a capability to provide an "on-demand" impact assessment capability when events do occur.

The request continues to support important work in research and development, modeling and analysis, and support to states and regions on grid and energy infrastructure challenges. Other elements in the FY 2015 budget are discussed below.

TRANSMISSION RELIABILITY

The Transmission Reliability program, funded in FY 2015 at $18 million, develops advanced technologies that enhance the reliability of the electricity transmission infrastructure, with a focus on advanced monitoring and control applications that give transmission system operators real-time information to improve system operations, reliability and efficiency. Time synchronized measurements from advanced sensors installed on the transmission system, known as synchrophasors, can monitor the flow of electricity with much greater precision and provide unprecedented insight and information on system health. These data provide operators with wide area visibility and situational awareness, allowing them to foresee and respond to potentially destabilizing events, thus improving reliability, reducing the number and extent of blackouts, and speeding power restoration. In FY 2015, OE will accelerate development of synchrophasor-based, cyber-protected software applications to become operational, real time systems installed in grid operator control rooms. These applications will monitor and control the grid with advanced analysis, visualization, and decision-support tools, maximizing the value of synchrophasor data now available to grid operators to improve reliability and operations.

ADVANCED MODELING GRID RESEARCH

Turning real-time data into actionable information requires an understanding of not only "what is happening" but also "what could happen." The $11 million requested in FY 2015 for the Advanced Modeling Grid Research program advances and applies computational and mathematical scientific methods and models needed to transform the tools that underpin electric system operations and planning. Research will focus on the modeling, computational and mathematical advancements that are the foundation for the Next-Generation Energy Management System, used by operators to monitor and control the electric system, improving performance while managing the increased uncertainties of variable renewable resources and customer demands.

Models can provide insight on implications for reliability and help identify the most effective action amidst a myriad of options. Accurate and validated models are a critical enabler of system transformation by applying real-time situational awareness and measurement-based, fast control. Likewise, when a reliability event does occur, model-based decision support tools are essential to identify opportunities for operational flexibility and help guide operators along a path to quick recovery.

ENERGY STORAGE

The Energy Storage program addresses critical challenges facing the development and deployment of grid energy storage technologies, which can enhance system reliability and resilience, enabling both greater adoption of renewable energy resources and more effective utilization of the existing electric system. The research and development activities focus on improving the economic competitiveness and technical performance of a suite of emerging energy storage technologies. Testing and field demonstration efforts are collaborative with manufacturers, states, and utilities to establish experience and confidence in safety, performance and reliability of storage technologies. Analysis, including the development of analytic tools, serves to inform stakeholders and guide research and development investments. Together these efforts will accelerate implementation of emerging storage technologies to advance the modernization of the electrical utility grid. The request of $19 million in FY 2015 is focused on addressing challenges related to cost reduction, system engineering, performance improvement and validation, value recognition, and deployment confidence and acceptance, as well as an increased emphasis on the safety and reliability of energy storage systems. Advancements in these areas will be vital in the progress towards commercially sustainable deployment of energy storage solutions to enable more clean energy solutions and enhance the reliability and resiliency of the grid.

NATIONAL ELECTRICITY DELIVERY

Developing the grid of the future requires not only advancements in grid technologies and robust analytical capabilities, it also needs a strong portfolio that can help plan for and address new challenges and opportunities. Challenges include a changing electric generation mix, replacement of aging infrastructure (transmission, distribution, and generation), updated communication networks, and accommodating new end-use technologies that all must be balanced against the need for cost control, physical and cyber security, improved reliability and resiliency, and flexibility to deal with market uncertainties and a changing climate. State, regional, and tribal entities may have limited in-house capabilities to consider the effects of these rapidly evolving policies and challenges. With a requested $7 million in funding for FY 2015 for the National Electricity Delivery program, OE continues to provide technical assistance to states, regions, and tribal entities to develop, refine, and improve their programs, policies, and laws related to electricity in order to facilitate the development and deployment of reliable and affordable electricity infrastructure.

The FY 2015 request also supports OE's efforts to facilitate construction and operation of existing and new transmission infrastructure. These efforts include drawing attention to areas of the country that need to address transmission congestion through a triennial congestion study; and permitting of new trans-border transmission lines with Canada or Mexico.

OE also coordinates permitting of transmission infrastructure pursuant to section 216(h) of the Federal Power Act, which requires DOE to coordinate Federal permitting for new transmission projects involving Federal lands. The FY 2015 request supports the Department's efforts in implementing an Integrated, Interagency Pre-Application (IIP) process for transmission projects requiring multiple Federal authorizations as required by a June 7, 2013 Presidential Memorandum and in support of section 216(h).

PROGRAM DIRECTION

The FY 2015 budget request includes $29 million for Program Direction, which supports Federal staff that provides executive management, programmatic oversight, and critical technical and administrative support necessary for the effective implementation of the OE program. The request funds 112 Full Time Equivalents (FTEs) in FY 2015, based in Headquarters and at the National Energy Technology Laboratory in West Virginia.

CONCLUSION

OE's FY 2015 budget request of $180 million will maintain steady, sustained progress towards modernization of the Nation's electricity system. OE's strategy supports and is aligned with the President's "all of the above" strategy, which calls for developing a balanced portfolio of America's energy resources, giving consumers more options to save money and reduce energy use, and promoting the creation of innovative technologies to move the Nation closer to a secure and independent energy future. This vision – with an eye on both the present and the future – is crucial, as more changes that are rapidly redefining the U.S. energy landscape and the Nation's power grid continue to emerge.

Collaboration and seamless integration of efforts are critical. OE not only works collaboratively across its own organization to develop strategic solutions needed to address the challenges of modernizing the grid; OE also works closely with other Department of Energy offices, including through the Department's Grid Tech Team, which evaluates critical technological and institutional needs facing the electric power system. Through this mechanism, OE works to ensure its investments in the grid infrastructure activities are leveraged and coordinated with other Department of Energy offices. OE is also supporting the Department as it examines the challenges associated with the transmission, storage and distribution of electricity through the Quadrennial Energy Review. We also work closely with individuals and organizations across the Nation – from industry, academia, and the Department's national labs to our partners at the local, State and Federal levels.

We are living in a time that demands both steadiness and adaptation; reliability and flexibility; and focus as well as a broader perspective that both considers the urgent needs of the present and anticipates the future. Our FY 2015 budget request invests in activities that will allow us to address these ongoing challenges and continue moving the Nation towards a more resilient and secure energy future.

This concludes my statement, Mr. Chairman. I look forward to answering any questions that you and your colleagues may have.

Mr. SIMPSON. Mr. Smith.

Mr. SMITH. Thank you, Mr. Chairman. Chairman Simpson, Ranking Member Kaptur, and members of the subcommittee, I appreciate this opportunity to discuss the President's fiscal year 2015 budget request for the Office of Fossil Energy programs. The Office of Fossil Energy's primary mission is to ensure that we are able to use our fossil energy resources in the most efficient and sustainable ways possible. Technologies evolvement is critical to this mission, and the Office of Fossil Energy Research and Development is focused on technologies that promote a reliable and environmentally sound use of fossil fuels, particularly coal and unconventional natural gas.

Our office also manages the Nation's Strategic Petroleum Reserve, the Northeast Home Heating Oil Reserve, and the Naval Petroleum Reserves.

President Obama's fiscal year 2015 budget seeks a total of $711 million for the Office of Fossil Energy. So beginning with the Fossil Energy Research and Development Program, I would like to provide a very brief highlight of the President's request.

This year's budget includes $475 million for the Fossil Energy Research and Development Program, $277 million of that funding is focused primarily on advancing carbon capture and storage, or CCS. This research and development is targeted at carbon capture technology development, CO_2 storage and utilization options, as well as CO_2 monitoring, verification, and accounting, advanced power systems that support CCS, and cross-cutting research.

Our CCS research is centered primarily on coal-fired power plants and industrial facilities. But we are also dedicating resources to capturing carbon pollution from natural gas power plants.

This year's request includes $25 million for a new natural gas carbon capture and storage demonstration program. This program will build on our ongoing CCS demonstration program.

We also conduct research and development on the prudent development of domestic unconventional oil and gas resources. With the budget request of $35 million, the natural gas technologies research and development program will focus on developing technologies to enable the safe and responsible development of our unconventional domestic natural gas resources. This request includes $15.3 million to contribute to continue our collaborative research and development with the Environmental Protection Agency and with the U.S. Geological Survey to minimize the potential impact of shale gas development; $4.7 million to fund a new program focused on technologies to detect and mitigate methane emissions from natural gas systems; and $15 million for methane hydrates research.

Turning to our Office of Petroleum Reserves, this year's budget includes $205 million for the Strategic Petroleum Reserves to fund a major maintenance program to reduce the backlog of deferred maintenance projects as well as ongoing projects to ensure the readiness of the Strategic Petroleum Reserve.

It also includes $1.6 million for the Northeast Home Heating Oil Reserve, which includes funding for continued storage of the 1 million barrels of ultra low sulphur diesel that is stored in the Northeast Home Heating Oil Reserve.

The President is also requesting nearly $20 million for the Naval Petroleum and Oil Shale Reserves to carry out environmental remediation and disposition activities at NPR 1 in California, and the Rocky Mountain Oilfield Testing Center in Wyoming.

Finally, the budget includes $15.6 million for the final payment to the Elk Hills School Lands Fund, which was a result of the settlement with the State of California with respect to its longstanding claim that title to two sections of land within NPR 1.

The Office of Fossil Energy is committed to developing the science and technology that will allow the Nation to use its abundant fossil energy resources in a way that balances our energy needs with our environmental responsibility. The fiscal year 2015 budget request will help maintain DOE's leadership role in addressing issues of energy and environmental security. We believe this budget will provide resources that we need to achieve those goals.

With that, Mr. Chairman, I would be happy to answer any questions that you have at this time.

Mr. SIMPSON. Thank you. Thank all of you. You were very efficient. I appreciate that.

[The information follows:]

Statement by Christopher Smith
Principal Deputy Assistant Secretary for Fossil Energy
U.S. Department of Energy

FY 2015 Appropriations Hearing
House Committee on Appropriations
Subcommittee on Energy and Water Development

March 25, 2014

Chairman Simpson, Ranking Member Kaptur and Members of the Subcommittee, it is my pleasure to appear before you today to discuss the Department of Energy's (DOE) Office of Fossil Energy's (FE) programs.

The Office of Fossil Energy (FE) advances technologies related to the reliable, efficient, affordable, and environmentally sound use of fossil fuels which are essential to our Nation's security and economic prosperity. FE leads Federal research, development, and demonstration efforts on advanced carbon capture, and storage (CCS) technologies to facilitate achievement of the President's climate goals. FE also develops technological solutions for the prudent and sustainable development of our unconventional domestic resources.

FE also manages the Nation's Strategic Petroleum Reserve (SPR). The SPR, with a capacity of 727 million barrels, serves as the largest stockpile of government-owned emergency crude oil in the world. The SPR helps ensure U.S. energy security by providing protection against disruptions in U.S. oil supplies. It also allows the United States to meet, in combination with commercial stocks, its International Energy Agency (IEA) obligation to maintain strategic oil stocks equal to ninety days of net oil imports.

In addition to the SPR, FE oversees the Northeast Home Heating Oil Reserve, which provides a short-term supplement to private home heating oil supplies in the Northeast in the event of a supply interruption. The Office also manages the Naval Petroleum Reserves.

Fiscal Year 2015 Budget Request

President Obama's Fiscal Year (FY) 2015 budget seeks $711.0 million for FE to advance technologies related to the reliable, efficient, affordable and environmentally sound use of fossil fuels as well as manage the Strategic Petroleum Reserve and Northeast Home Heating Oil Reserve to provide strategic and economic security against disruptions in U.S. oil supplies.

The FY 2015 request includes $475.5 million for FER&D, $205.0 million for the Strategic Petroleum Reserve, $1.6 million for the Northeast Home Heating Oil Reserve and $19.95 million for the Naval Petroleum Reserves. The Northeast Home Heating Oil Reserve FY 15 budget request includes the use of $6 million in prior year balances bringing it to a total of $7.6 million.

Beginning with the FER&D program, I would like to provide an overview of the President's Fiscal Year 2015 budget request for the Office of Fossil Energy.

Fossil Energy Research and Development

The President's FY 2015 budget requests $475.5 million for the DOE's FER&D portfolio. FE leads Federal research, development, and demonstration efforts on advanced carbon capture and storage (CCS) technologies to facilitate achievement of the President's climate goals. FE also develops technological solutions for the prudent and sustainable development of our unconventional domestic resources.

In FY 2015, Fossil Energy Research and Development will continue to focus on carbon capture and storage and activities that increase the efficiency and availability of systems integrated with CCS.

CCS Demonstrations

FER&D manages the Clean Coal Power Initiative program along with two American Recovery and Reinvestment Act CCS demonstration programs: FutureGen 2.0 and the Industrial Carbon Capture and Storage program under the CCS Demos program.

The FY 2015 request includes $25 million for a new demonstration program, Natural Gas Carbon Capture and Storage (NG-CCS), to support projects to capture and store carbon emissions from natural gas power systems. The ability to demonstrate advanced technologies at a scale that has been developed within the FER&D or other R&D programs is an important benefit of the demonstration programs.

The requested funds would be competed to fund work that demonstrates technology to capture and store more than 75 percent of the carbon from treated emissions from a natural gas power system.

Carbon Capture & Storage and Power Systems

The CCS and Power Systems program conducts research to reduce carbon emissions by improving the performance and efficiency of fossil energy systems and CCS technologies. The FY 2015 budget request for the program is $277.4 million. This includes $34 million for National Energy Technology Laboratory (NETL) staff to conduct in-house coal R&D.

Carbon Capture. The President's FY 2015 budget requests $77 million for carbon capture R&D. The Carbon Capture activity is focused on the development of post-combustion and pre-combustion CO_2 capture and compression technologies for new and existing fossil fuel-fired power plants and industrial sources.

The President's FY 2015 budget request includes:

- *Post-combustion CO_2 capture technology* – \$65 million for R&D focused on capturing CO_2 from flue gas after the fuel has been consumed/combusted.
- *Pre-combustion CO_2 capture technology* – \$12 million for R&D of systems that capture and separate the CO_2 from mixed gas streams prior to combustion or utilization of the gas.

The decrease in funding for post-combustion R&D reflects a level sufficient to continue scale –up of 2nd generation technologies through large-scale pilot projects and laboratory and bench-scale testing of transformational technologies for fossil-fuel-fired plants.

Carbon Storage. The President's FY 2015 budget requests \$80.1 million for carbon storage R&D. The overall goal of the Carbon Storage Program is to develop and validate technologies to ensure safe and permanent geologic storage of captured CO_2. Development and validation of these technologies is critical to ensure industry and regulatory agencies have the capability to assess, monitor and mitigate storage risks for CO_2 onshore and offshore storage and ensure the viability of carbon storage as an effective technology solution that can be implemented on a large-scale to mitigate carbon emissions.

In FY2015, the Regional Carbon Sequestration Partnership (RCSPs) subactivity will be renamed Storage Infrastructure to better represent the characterization and field activities that occur in the RCSPs and other small and large-scale field projects in a variety of geologic reservoirs in onshore and offshore settings.

Funding for Carbon Storage activities is decreased while continuing the Storage Infrastructure activities on large-scale injection operation and monitoring activities and supporting small-scale field projects for other geologic storage formation classes. Funding for Geologic Storage Technologies is decreased while continuing to focus on understanding risks and addressing geo-mechanical impacts such as induced seismicity.

The FY 2015 request includes:

- *Storage Infrastructure* – \$60.8 million for the development and validation of technologies, infrastructure, and human capital through the RCSPs and other small- and large-scale field projects. These field projects conduct regional and site-specific characterization and validation; simulation and risk assessment; and application of monitoring, verification, accounting and assessment (MVAA) technologies for various storage reservoirs. (MVAA of geologic storage sites addresses safety and environmental concerns; verifies migration of CO_2 to meet regulatory requirements; and accounts for greenhouse gas (GHG) emissions mitigation to help achieve GHG reduction goals).
- *Geologic Storage Technologies* – \$8.5 million focused on developing and validating storage and simulation and risk assessment technologies that have the potential to safely, permanently, and cost effectively store CO_2 in both

conventional and unconventional geologic reservoirs for onshore and offshore project settings.

- *Monitoring, Verification, Accounting and Assessment* – \$4.5 million for the development and validation of technologies in field projects to monitor CO_2 at atmospheric, near-surface and subsurface levels for integration into an intelligent monitoring system.
- *Focus Area for Carbon Sequestration Science* – \$7.0 million R&D activities that include Reservoir and Seal Performance; Geologic Storage Optimization and Operations; Storage Capacity and Efficiencies; Integrated Modeling and Monitoring Technologies; Resource Assessments and Geospatial Resources; and CO_2 Use, Re-Use and Conversion.

Advanced Energy Systems (AES). The President's FY 2015 budget requests \$51.0 million for advanced energy systems R&D. The AES mission is to increase the availability and efficiency of fossil energy systems integrated with CO_2 capture, while maintaining the highest environmental standards at the lowest cost. The program elements focus on gasification, oxy-combustion, advanced turbines, and other energy systems.

In FY 2015, the decreased funding enables the program to continue the development, through design and construction, of pressurized oxy-combustion and chemical looping combustion pilot-scale systems; continue development of materials engineering design for hydrogen turbines; continue advanced gasification technology component development such as oxygen membranes, warm gas cleanup and hydrogen separation at bench through pilot-scale; and continue the Solid Oxide Fuel Cell (SOFC) Program to focus on durable SOFC materials.

The FY 2015 request includes funding for:

- *Advanced Combustion Systems* – \$15.0 million for the development of advanced combustion technologies, such as pressurized oxy-combustion and chemical looping processes.
- *Gasification Systems* – \$22.0 million to continue to support the development of advanced oxygen production, dry feed technologies for low rank coal use, warm-gas cleanup, and hydrogen separation.
- *Hydrogen Turbines* – \$11.0 million for the development of key turbine system components capable of achieving a four percentage point efficiency increase relative to existing combined cycle turbines.
- *Solid Oxide Fuel Cells* – \$3.0 million reflects the narrowed focus of the program to materials research.

Cross-cutting Research. The President's FY 2015 budget requests \$35.3 million for crosscutting research. The Program serves as a bridge between basic and applied research by targeting concepts that offer the potential for transformational breakthroughs and step change benefits in the way energy systems are designed, constructed, and operated. In addition, the

Cross-cutting Research Program leads efforts that support University-based energy research including science and engineering education at minority colleges and universities.

The FY 2015 request increases the amount for Coal Utilization Science, including Computational System Dynamics and the Focus Area for Computational Energy Science. This funding level will support the Carbon Capture Simulation Initiative to facilitate more rapid development and commercialization of capture technologies, and the National Risk Assessment Project, to quantify and understand the risks from carbon storage. It also includes Grid Tech to enable fossil-based facilities to better integrate with advanced grid technologies (i.e., smart grid).

The President's FY 2015 request includes:

- *Plant Optimization Technology* – $7.04 million for sensors and controls;
- *Coal Utilization Science* – $23.6 million for computation systems dynamics and computational energy science;
- *Energy Analyses* – $0.85 million for environmental activities and technical and economic analysis;
- *University Training and Research* – $2.75 million for university coal research, historically black colleges and universities education and training; and
- *International Activities* – $1.1 million to support FE's commitment to the International Energy Agency Clean Coal Center (IEACCC) to enhance the competitiveness and adoption of U.S. Clean Coal Technologies in targeted countries that will help protect the local and global environment. It will also preserve and enhance active relationships with national and international organizations by focusing on expanding cleaner energy technology power systems activities globally.

Natural Gas Technologies. The mission of the Natural Gas program – with a FY 2015 budget request of $35.0 million – is to support DOE missions in energy, environment and national security. The Natural Gas Technologies program will focus on developing technologies to mitigate air and water impacts and reduce the surface and subsurface footprint to enable safe and responsible development of unconventional domestic natural gas resources.

The FY 2015 request includes $15.3 million to implement priority collaborative research and development with the Environmental Protection Agency and Department of the Interior to ensure that shale gas development is conducted in a manner that is environmentally sound and protective of human health and safety. The program will focus on research in such areas as water quality, water availability, air quality, induced seismicity, and mitigating the impacts of development (e.g. wellbore integrity, improve environmental footprint, and reduce water use). This research includes advancements in technology, methodology, risk assessment, and mitigation consistent with this multiagency effort.

The FY 2015 request also includes $4.7 million to fund a new midstream natural gas infrastructure program focused on advanced cost-effective technologies to detect and mitigate methane emissions from natural gas transmission, distribution, and storage facilities and to communicate results on methane emissions mitigation to stakeholders.

In addition, the request includes $15 million to conduct lab- and field-based research focused on increasing public understanding of methane dynamics in gas-hydrates bearing areas. These public sector-led efforts will be designed to evaluate the occurrence, nature and behavior of naturally occurring gas hydrates and resulting resource, hazard, and environmental implications.

Petroleum Reserves

FE's Office of Petroleum Reserves manages programs that provide the United States with strategic and economic protection against disruptions in oil supplies.

Strategic Petroleum Reserve. The Strategic Petroleum Reserve protects the U.S. from disruptions in critical petroleum supplies and meet the emergency oil stock holding obligations under the International Energy Agency (IEA). The current 696 million barrel reserve provided 112 days of net oil import protection in 2013. The most recent drawdown of the SPR was 30 million barrels in FY 2011 as the U.S. obligation under the IEA Libya Collective Action.

The FY 2015 budget request for the Strategic Petroleum Reserve is $205 million. The funding increase includes support for a larger Major Maintenance program required to reduce the backlog of deferred maintenance projects. The program will continue the degasification of crude oil inventory to ensure its availability; testing and cavern remediation; a cavern maintenance program to slow the loss of cavern storage capacity; and repair the crude oil tank at Bryan Mound that will restore the program's maximum drawdown rate.

Northeast Home Heating Oil Reserve. The Northeast Home Heating Oil Reserve (NEHHOR) provides a short-term supplement to the Northeast systems' commercial supply of heating oil in the event of a supply interruption. In FY 2011, the NEHHOR Program completed the sale of all 2 million barrels of its high sulfur heating oil inventory located in commercial storage. In FY 2012, NEHHOR converted to a 1 million barrel configuration of Ultra Low Sulfur Diesel (ULSD) stored in the Northeast terminals, to meet new Northeast states' emission standards being instituted. The FY 2014 program will continue operation of the 1 million barrel Reserve of ULSD in Groton, CT, and Revere, MA. The FY 2015 budget request of $1.6 million for continuing storage of the 1 million barrels assumes use of $6 million in prior year balances to meet projected requirements, which includes the re-solicitation of both terminal contracts at market rates.

Naval Petroleum and Oil Shale Reserves. The FY 2015 budget requests $19.95 million for the Naval Petroleum and Oil Shale Reserves (NPOSR). The NPOSR program manages a number of legal agreements that were executed as part of the 1998 sale of NPR-1 in California. These agreements direct post-sale work including environmental restoration and remediation, contract closeout, and records disposition. The NPR-1 program continues to work towards closing out the remaining environmental findings, as required by the 2008 agreement between DOE and the California Department of Toxic Substance Control. DOE also operates NPR-3 and RMOTC, co-located near Casper, Wyoming. NPR-3/RMOTC will implement the approved disposition plan with final disposition of the property estimated to occur by December 2015.

Elk Hills School Land Fund. The Elk Hills School Lands Fund, subject to appropriation, provides a source of compensation for the California State Teachers' Retirement System as a result of a settlement with the State of California with respect to its longstanding claim to title of two sections of land within NPR-1. In 2011, the Department and the State of California agreed on the final, last payment of $15.6 million. Funding for this payment is requested in the FY 2015 budget.

Conclusion

The Office of Fossil Energy is committed to developing the science and technology that will allow the Nation to use its abundant fossil energy resources in a way that balances the energy needs for sustaining a robust economy with environmental responsibility. The FY 2015 budget request will help maintain DOE's leadership role in addressing issues of energy and environmental security. We believe this budget will provide the resources needed to achieve these goals while ensuring maximum benefit to U.S. taxpayers.

Mr. Chairman, and members of the Committee, this completes my prepared statement. I would be happy to answer any questions you may have at this time.

Mr. SIMPSON. Let me first turn to Dr. Lyons. I suspect you might have suspected this question was coming. I was surprised to hear the rumors that Babcock and Wilcox might be reassessing its participation in the SMR licensing technical support program. Can you provide us with an update on how the Department is progressing with this program? And has the Department conducted a business-case analysis for the SMR reactors in the United States?

Mr. LYONS. Thank you, Mr. Simpson.

First, the Department remains committed and enthusiastic about the future of the small modular reactors. We see them as an important contribution to American competitiveness, American jobs, and American clean energy. We, too, have read the announcements that B&W has made. But we have yet to hear a definitive proposal from B&W mPower. So I do not know what their plans are at this time. However, we have reminded both B&W, with whom we have the cooperative agreement, and mPower, as well as the negotiations that are in progress with NuScale, that the intent of this program remains U.S. manufacture, U.S. intellectual property, and U.S. competitiveness. And we expect, if there is any proposals forthcoming, they would have to comply with those criteria in order for us to accept any proposal. But we don't know what they are going to propose at this time.

As far as business case, yes, we completed a review done by the University of Chicago on the business case for SMRs. There have been a number of other papers written on SMRs that were in somewhat less detail. That University of Chicago report is being updated and will be available later this summer.

Our enthusiasm in the SMRs is an important contributor to a new generation of nuclear power remains as it was.

Mr. SIMPSON. Following up on one of the things you mentioned, as you know, one of the challenges we have with large nuclear reactors is that we don't build a lot of the materials here in the United States like the reactor vessels and so forth. One of the hopes of SMRs is that we would create a supply chain of manufacturing within the United States. Is there any evidence that any of that is starting to occur yet?

Mr. LYONS. Both mPower and NuScale have been working with a number of U.S. companies and are proceeding to develop that supply chain. And from a technical standpoint, I am not aware of any issues in the mPower, B&W work.

Mr. SIMPSON. Okay. You mentioned during your testimony that we have shut down nuclear power plants. How many have we shut down?

Mr. LYONS. Four have shut down this year, with an announcement that one more, Vermont Nuclear, will shut down next year.

Mr. SIMPSON. Have they been shut down because of age and so forth? Or is the price of natural gas having something to do with that and making them less competitive?

Mr. LYONS. Each of the plants would have a somewhat different story. But the economics of each plant has led to the shutdown. Now, in some cases, there were also major equipment issues at some of the plants that, of course, could have been fixed if the economics had been appropriate.

Certainly, natural gas prices are part of the issue. But so is a flat demand for electricity and probably other factors such as renewable mandates that also enter in. It depends very much on the market.

Mr. SIMPSON. Thank you.

Ms. Kaptur.

Ms. KAPTUR. Thank you, Mr. Chairman. Dr. Lyons, I wanted to ask you, on those shutdowns of nuclear power plants, are they in any particular region of the country or were they in all regions?

Mr. LYONS. They are widely spread around the country, but they are all in deregulated environments. I could list them if you want.

Ms. KAPTUR. Which States?

Mr. LYONS. California, Florida, Wisconsin, and Vermont will shut down next year.

Ms. KAPTUR. All right. I am very concerned about how nuclear will fare in light of the current and projected natural gas prices in regions like my own, which is not in a regulated environment.

The possibility of thousands of lost jobs hang in the balance as well as the capacity. And I am wondering how nuclear will fare in light of the current and projected natural gas prices. And what you might be able to tell us about the outlook being different for regulated plants receiving cost of service rates than for unregulated merchants plants compensated market-based rates. How do we, particularly from a part of the country where we have no energy umbrella, how is the Department of Energy looking at this situation and helping these companies to adjust to this new reality? Or what should we be doing to help them to adjust?

Mr. LYONS. First let me note that the locations of new construction in the United States are in regulated environments, where public utility commissions can evaluate a range of factors, including the importance of fuel diversity and look at a long-range future for their State. In the deregulated, or market environments, that is certainly much more challenging.

We certainly have been exploring this from a departmental perspective. It is extremely hard to find a single solution from a Federal level that would address the diverse market factors across the country, although we continue to seek that.

There are, in a number of cases, actions that States have taken to work with utilities within their States. And those appear to be quite effective in a number of cases and there has been publicity about several ongoing negotiations between States and nuclear power plants within those States perhaps looking at long-term power purchase agreements.

Ms. KAPTUR. Thank you for that clarification. This remains a deep concern for those of us that represent nuclear power plants in States like Ohio. I just want to place that on the record.

I also wanted to ask you, in the 2014 omnibus bill, there was direction to the Department to evaluate the State of nuclear tradecraft and prepare a report by July of 2014. I don't know what the status of that report is, and that is the reason for my question.

And, attendant to that, I just wanted to invite you out, or any of your associates, to the region that I represent to look at the various trade schools that our building trades have created for plumbers and pipe fitters, boilermakers, and electrical workers that work in nuclear power plants. I was talking to Senator Feinstein. She doesn't have anything like that in her region, which was quite a surprise to me.

I am interested in the Department becoming aware of the incredible training in capacity building that is done in these trade schools. And I am not sure that the Department is. I just wanted to put that on your horizon, as you travel around the country. And I would like to draw your attention to them.

Mr. LYONS. Thank you for that comment and question.

We are proceeding to work on the requested report. We are involving both nationalized and industry through NEI and EPRI in developing a comprehensive report. And we anticipate having that report for you as requested in July.

With respect to some of the trade school comments, I have not visited trade schools in Ohio, I don't believe. I have participated in a number of forums at the Ohio State University at which a number of those schools have also been represented. And I am somewhat aware, but I would like to learn more about the excellent work that is being done as you said, in preparing trades for these important skills.

Ms. KAPTUR. Thank you very much. I look forward to that opportunity.

Mr. Chairman, I will save my questions for the next round.

Mr. SIMPSON. Thank you. Mr. Fleischmann.

Mr. FLEISCHMANN. Thank you, Mr. Chairman. And welcome, everybody. I want to thank this entire panel. Ms. Hoffman, good to see you.

I want to particularly thank Dr. Lyons for spending a tremendous amount of time with me over the past couple years, he has brought me up to speed.

Dr. Danielson, I want to thank you as well. And I want the committee to know, Dr. Danielson has not only been to Oak Ridge to see our carbon fiber research, but just last month, he came to Chattanooga and then went to Oak Ridge. And in Chattanooga, I want to thank you, sir, for speaking to the Tennessee Advanced Energy Business Council, and then also going back to ORNL to see the lab's manufacturing demonstration facility. So really appreciate your-all's work with us.

Secretary Danielson, can you please give the subcommittee your thoughts on the impact that facilities like the Oak Ridge MDF will have on U.S. manufacturing leadership? And then as a follow-up to that, what are your plans, sir, to prioritize these unique user facilities and provide base funding for continued operation.

Mr. DANIELSON. Thank you, Congressman. You know, one thing I will point out is that I think we should all be optimistic that the winds are blowing in the direction in the United States for manufacturing competitiveness perspective. Talking to the private sector, you look at issues like rising wages overseas, especially in China, issues around IP protection in China and other countries, or rising inflation rates, and also an appreciation, a new found appreciation with businesses in the U.S. that you can't—you can't just have R&D here and do manufacturing elsewhere and continue to be a leader.

So we are seeing positive indications. And part of our strategy for kind of catalyzing more U.S. Manufacturing competitiveness is developing R&D facilities that allow a wide range of small and medium enterprises to tap in to cutting-edge manufacturing capabilities related to energy that they wouldn't be able to on their own.

And so the carbon fiber technology facility at Oak Ridge National Lab is a great example of that. And we have seen dozens of companies form a consortia around that facility, and we are seeing companies sprout up around that. So we are seeing some positive momentum, and we want to continue that with our work with Oak Ridge.

And I will say our work with NREL, our national laboratory, the National Renewable Energy Laboratory, for the first time we have designated a formal user facility, the Energy Systems Integration Facility, where we are providing base funding for that facility to help make it more accessible and affordable for companies and researchers. And that is something we are going to be looking very seriously at over the next year. It is considered—strong consideration of applying that across the board to our user facilities.

Mr. FLEISCHMANN. Okay. As a follow-up to that, you made a statement in Chattanooga, which I really liked, and I am quoting, "We are in a fierce race with China, so we have to have all hands on deck."

How does the U.S. stack up against the rest of the world, Mr. Secretary, in manufacturing innovation? And what measures are other governments taking to help their industrial sectors compete against us, sir?

Mr. DANIELSON. Thanks for that question. It is an important one. We have definitely seen strong support in other nations, whether it be, you know, long-term tax abatements or, you know, multiyear plans in China to then motivate—in my visit to China recently, I learned that, you know, it is not direct funding from the centralized government, but it is actually a multi-year plan they put out, a 5-year plan that then inspires local mayors and governors to invest to achieve those goals so that they are looked on favorably.

So there is a lot of strong policy support in other nations for advanced manufacturing. But I think we are seeing, with the standup of the National Network for Manufacturing Innovation and a user facility like manufacturing demonstration facility in Oak Ridge National Lab, we are seeing those as magnets for manufacturing innovation and manufacturing jobs. And I think we are seeing positive indications that companies are locating here and choosing to locate here. A company called Silevo, a high-end, high-efficient solar company, recently chose to put a 200-megawatt facility in upstate New York. And advanced LED company called Soraa recently made a commitment to put a facility, a large facility for advanced LEDS in the United States. And we just saw a big announcement from Tesla Motors that they are planning on building a multi-billion dollar battery factory somewhere in the southwest United States.

So I think we are seeing a lot of positive indications, but we are in a fierce race, and I think we have to keep at it in partnership with this committee.

Mr. FLEISCHMANN. Mr. Chairman, how much time do I have? Am I close?

Mr. SIMPSON. Getting there. Go ahead.

Mr. FLEISCHMANN. Okay. Thank you.

One more followup, Dr. Danielson. Other than the intellectual property protection that you have alluded to, how could the U.S. tackle the challenge of supporting research, at least the domestic manufacturing, and how do we keep American jobs here, sir?

Mr. DANIELSON. Thank you. That is a great question, and it has been on the forefront of my mind since I began my job 2 years ago, in large part, inspired by the report language in the seriousness with which this committee takes manufacturing competitiveness.

One year ago, in Oak Ridge National Lab, we launched Clean Energy Manufacturing Initiative, that is seeking to kind of strategically integrate, prioritize, coordinate efforts at EERE around manufacturing competitiveness. We have more than $554 million in specific manufacturing-focused R&D in this budget. And also, we have launched a comprehensive approach to clean energy manufacturing competitiveness analysis. And so we have been going through our portfolio and identifying the intrinsic cost structure of manufacturing various products and various parts of value chains in clean energy in the United States trying to identify the areas where we have strong opportunity to gain market share areas where, perhaps because of the importance of low-cost labor, we won't likely compete. So we have identified a number of opportunities.

Just to give you one example of an action we have taken is we learned in solar that Chinese modules and other modules were exhibiting lower quality than American-made high-quality goods. So they were degrading faster in the field. So we have worked with our National Renewable Energy Laboratory to create a new certification standard, which we call Qualification Plus, which is raising the game for being able to do a set of standard tests that allow investors to actually understand the difference between a high-quality module and a low-quality module. So that a high-quality module made by, for example, an American manufacturer would fetch a higher price instead of having to compete with a low-quality, Chinese module price.

Mr. FLEISCHMANN. Thank you, Mr. Chairman. I yield back. Thank you.

Mr. SIMPSON. Thank you.

Mr. Fattah.

Mr. FATTAH. Thank you very much.

I authored a lot of that report language and have been very focused on this issue about connecting off of American discoveries of American jobs. I think it is important that as we finance research that we connect it to jobs. So I am very pleased to hear about where you are headed and what you are doing already with the cooperative agreements that require domestic manufacturing. And we have also done that, Mr. Chairman, in the CJS bill, to require the same type of connection between scientific investment and domestic manufacturing.

But I wanted to talk to you about the energy efficiency building industry, where you see that at globally? And I ask you this relative to the future of the energy efficiency building hub in Philadelphia. As I understand it, we are not where our international competitors are in this global market about making builders more energy efficient. The DOE wanted to make a significant move in this direction. And I want to know how you see this going forward, given where we are?

Mr. DANIELSON. Thank you, Congressman. Thank you for your leadership and support for clean energy over the years. Greatly appreciate that.

You know, in the building sector, you know, if you look at efficiency, our big national goal is to double our energy productivity of this country by 2030. And so a big part of that is going to be achieving, ideally, 50 percent more efficient buildings to make that goal occur. Interestingly, we have the technologies today. We have seen LEDs and other technologies dramatically come down in costs. Where an LED light bulb is being sold for about $10 at Wal-Mart today, when it gets into that $3 to $5 range, is when it really takes off like a rocket ship.

But we have the technologies to achieve about 20 percent efficiency improvement in our buildings today. A lot of challenges are developing integrated packages and solutions that can be readily and easily adopted by the industry.

And, as you know, we have refocused the effort with Penn State into the Penn State energy efficient—sorry—Penn State Consortium for Building Energy Efficiency, where we focused it down to what we consider to be a very high opportunity area that is not covered, while one of the more difficult areas to access is small and medium commercial building. Because there is a lot of diversity in those buildings. So we are working with that Penn State consortium. We have a bold goal of 50 percent. Develop a wide range of implementable solutions that can reduce the energy use and drive 50 percent in small and medium commercial buildings.

This is an area where we have historically, I think, been underinvesting. And also, I would say that the effort at Penn State is going to be the most significant national effort in this area, and we are excited to continue forward with that work.

Mr. FATTAH. Where does the U.S. stand relative to the industry internationally? Are we ahead? Are we behind? Where are we?

Mr. DANIELSON. Could I ask you a clarifying question?

Mr. FATTAH. The industry, the money being made on developing more energy efficient buildings.

Mr. DANIELSON. You know, the building industry—you know, the building industry—building stock in Europe is more efficient than our building stock. We have a great opportunity to move forward. My office develops a national model building code standards, which really is trying to show what can be done cost effectively and ensure that that gets adopted by the States. And this budget puts forward increased investments in working with our State partners to develop ways to enforce building codes more effectively, which has been a challenge in the United States and has resulted in less deployment of building efficiency than we think is possible.

Mr. FATTAH. Let me thank you for what you have done. I have met with the chairman on this. You know, I have every intention of trying to encourage the Department to fully embrace as a hub this focus on energy-efficient buildings. So we will continue to work with you as we go forward. And I have been quite engaged in the work of this subcommittee for a very long time and on a whole range of issues important to the Department, including the labs and the manufacturing work. This is very important to me. And I intend to revisit it as we go through the markup process.

Ms. KAPTUR. Would the gentleman yield?

Mr. FATTAH. I would be glad to yield.

Ms. KAPTUR. I just wanted to put on the record that I was out at Argonne this past week. And what was interesting about that was that I was handed a report about energy efficiency and redevelopment in America's urban communities. And though Congresswoman Barbara Lee of Oakland, along with Congressman Fattah have been leaders on many fronts for American cities, I was actually surprised the Department of Energy had produced that report. But when I was out at Livermore, of course, they didn't give me that report. Because the report came out of Argonne.

So the point I want to make here is, I think, Congressman Fattah, through your leadership, things are beginning to bubble up inside the Department of Energy, but they do seem to need a focus. And in engaging the built environment, and particularly where it is older and needs to be upgraded. But I see the Department trying to get there. And I support you in your efforts. And I just wanted to put that on the record, because I think there could be more focus at the national office to help these individual labs work together.

Mr. FATTAH. Thank you.

Thank you, Mr. Chairman.

Mr. SIMPSON. Thank you. Mr. Nunnelee.

Mr. NUNNELEE. Thank you, Mr. Chairman.

Mr. Smith, we all watched over the last few years an enormous economic activity associated with the recovery of natural gas and the promise that our country can build a liquefaction infrastructure to sell part of our excess gas to our friends and allies around the world. This has a broad economic impact in the United States. We have been reminded by global events over the last few months, if not the last few weeks, of the importance of trade with this product with our partners in Europe and elsewhere.

So as I look at the budget for fossil energy, I note there is a $68 million decrease in the President's budget for fossil energy. If I am reading this budget correctly, the administration has asked for $2 million in fiscal year 2015 for import/export authorization which is a small decrease over the 2014 level.

This funding is just to handle the export licenses, not any of the safety or technical construction aspects, which are overseen in a much more comprehensive process at the Federal Energy Regulatory Commission.

Now, I was pleased to see the Department yesterday make progress toward the backlog when you issued the permit. But I also understand we have 20 pending applications right now from the Department. There are eight that have been at Department of Energy for more than 555 days. So, is this budget request sufficient to process the significant backlog for permit applications for the Department?

Mr. SMITH. Well, thank you very much, Congressman, for that question. First of all, I think you raise a good and very important point in that over recent years, we have certainly gone from a period of relative scarcity to a period of relative abundance in terms of natural gas that is available for domestic economy to create jobs in the United States. We see that in unambiguously positive. That also creates an opportunity to potentially take natural gas and export it from the United States externally, which also potentially brings some benefits in terms of job creation, balance of trade, and some other areas.

We have a process within the Department of Energy of looking at balancing that important public interest determination that goes behind each of these export applications. Section 3 of the Natural Gas Act dictates the public interest requirements for exporting natural gas to free-trade agreement countries. So we have established a process that we want to be open, we want it to be transparent. We have to take into account the varying views of stakeholders that are important for our economy. And we want to proceed on this on a case-by-case basis in a meticulous way that is going to withstand the scrutiny that it is certain to face.

You point out that we just released an order yesterday for a Jordan Cove that was the seventh order that we processed within the last couple years. We are moving through a queue that we have published. So it is our intent to move forward with that process in a way that is expeditious, but which also recognizes the complex and important public-interest determination that we have to make for each of these applicants.

Mr. NUNNELEE. All right. Thank you.

Ms. Hoffman, Dr. Lyons, there have been a large number of baseload nuclear plants that have recently announced closures. Are you concerned about this trend? And will this impact our Nation's grid reliability?

Mr. LYONS. Well, to start the response, certainly we are concerned from the perspective of it is reducing the Nation's clean energy resources, making any future plans for our particular goals in clean energy that much more difficult.

I should probably let Pat Hoffman talk about the grid's reliability.

Ms. HOFFMAN. From the reliability perspective, the Nation needs a diversity of energy resources. We need baseload energy, intermediate energy, and energy to provide peaking resources. First, with the shutdown of the nuclear power plant, a large megawatt capacity is going off on the grid. This means compensatory resources have to be built to fill in for that capacity that is missing. So it is getting that capacity built and putting in the necessary infrastructure that is a concern. The timing of the shut down of the capacity as well as some of the other adjustments that have occurred in the energy mix can make things challenging. We have to watch very closely to understand potential reliability implications and system requirements.

Mr. NUNNELEE. Have I got time for another one, Mr. Chair?

Mr. SIMPSON. Go ahead.

Mr. NUNNELEE. Let me just also briefly ask, recently, the Electric Power Research Institute released a study that addressed the issue of being "off the grid." And in that study, they talked about the startup energy that is required, which can be as great as five times that of normal operation. So while the administration is looking at making recommendations, have you factored into this startup requirements in terms of the baseload?

Ms. HOFFMAN. So with respect to black start capabilities, reliability coordinators must include the resources needed for startup requirements. However, incentivizing generators to have that black start capability is challenging because in competitive markets people want to provide power resources and have limited ability in getting compensation for black start capabilities. We are looking at that, but it is a concern that will be growing in the future, of having that resource that is available for black start.

Mr. NUNNELEE. Thank you, Mr. Chairman. I yield back.

Mr. SIMPSON. Thank you.

And now for a new member of our subcommittee. Welcome. We are glad to have you on this subcommittee. Look forward to working with you, Mr. Graves from Georgia.

Mr. GRAVES. Thank you, Mr. Chairman. Happy to be a part of the subcommittee. And thank you, panel, for being here. First, Dr. Lyons, let me thank you for your positive words as they relate to Plant Vogtle in Georgia. Not only is the plant important to our State, but it and the precedent it sets are certainly important to our Nation. Want to give you due credit. Thank you for all your work towards its progress.

And, Dr. Danielson, just a quick question as it relates to large-capacity water heaters and the efficiency standards that were adopted in 2010. There is a little bit of concern with some electric cooperatives about the standards and some unintended consequences that you are trying to address through some proposed rulemakings that are coming up in the near future.

Can you share with us a little bit about what your plans are and what can be expected as far as those rules go to eliminate some of the unintended consequences that are looming?

Mr. DANIELSON. Thanks for that question. It is an important example of including not only static efficiency in our considerations, but also grid dynamic operations. So we have had a lot of discussions with the rural folks that they are using water heaters as a way essentially to thermally store energy to balance out their grid. And so, you know, we are in ongoing discussions with them. And we are taking their concerns very seriously. But I would like to take that question for the record and follow up with you in greater detail.

Mr. GRAVES. Okay. So from the subcommittee's perspective, is it safe to say that you are taking their input and working with them to try to find a positive solution?

Mr. DANIELSON. Absolutely. We are in conversations with them. We are not being inflexible, and we are going to take all of their considerations into account.

Mr. GRAVES. Thank you for that. And do you have any idea what your timeline is for any rulemaking? Is there a goal?

Mr. DANIELSON. I am not certain on that. So I would like to take that question for the record. Follow up with you and your office directly.

Mr. GRAVES. Thank you.

That is all I have, Mr. Chairman. Thank you.

Mr. SIMPSON. Thank you.

Mr. Hoffman, this year's budget request contains an increase for infrastructure security, $15 million to be exact, to establish an operational energy and resilience program. This proposal, similar to last year's, would consist of a strategic operations center at the Department's headquarters and 17 staff to coordinate emergency responses during extreme events that affect the electricity grid.

Could you discuss what capabilities this would provide you that your office does not currently possess? And also along those same lines, your request also includes a staffing proposal, seven people at headquarters, 10 people embedded in each of FEMA's 10 regional offices. The committee has questioned this in the past. From what I understand, this is the minimum staffing needed and could likely grow in future years.

To put this in some perspective, your current budget supports only 80 employees overall for the entire office. We had similar questions last year about the need to embed staff in FEMA regions. Can you explain what has changed with your proposal since last year? And if your proposal is brought to its logical conclusion, what is your vision of the OER program? What does it look like when fully staffed to your satisfaction? How many people will be in the field? And how many people will be needed to staff the strategic operation center 24/7?

Ms. HOFFMAN. Thank you, Mr. Chairman.

Mr. SIMPSON. I know that was a lot of questions.

Ms. HOFFMAN. A lot of questions. I think I caught most of them. I'm writing it down.

First of all, let me say that the Department of Energy responds to a significant amount of energy events that occur on an annual basis. Most of the events that occurred have an energy component to it, whether it be a weather event, an ice storm, or like a fire event that occurred in California.

What we have done is over the years, since 2006, have produced over 181 situational awareness reports. The goal in what we do is to provide information to industry and to other Federal agencies on the status of the energy infrastructure to aid in the restoration timeline, and to build confidence out there during an emergency.

One thing is you want to make sure that the population, that the State and Federal agencies, that the industry is aware of what is going on and what needs to be done.

In addition to that, we have developed visualization tools that have provided support for the interagency process, looking at the status of power availability across the energy infrastructure, with over 350 users across the Federal agencies.

What we need to do is continue to support that visualization capability, but make it more real-time. Make it so that decisions can be more effective. Some of the capabilities that we are trying to build is more real-time information in areas that we didn't have the information during Hurricane Sandy. There were a lot of questions asked of the Department of which gasoline stations had power, had fuel. We weren't able to provide response in a timely fashion. And that is unacceptable from our perspective. Therefore we need to engage in the resources that are necessary to build some of those capabilities and have that information available to the States, to the Federal government, for the decisions that need to be made.

With respect to the additional staffing, it is important to have people in the field to understand what is happening on the ground. It is very hard, sitting in Washington, D.C., to actually be able to understand what is happening in the field, where some of the difficulties are in the restoration process. What we need is to have that link to the States and to the State emergency operations centers to be able to provide information directly to them for some of their decisions that they need to make in addition to the Washington, D.C. questions and the environment that occurs in the D.C. area.

So having people in the field is absolutely critical for us to get that on-the-ground information. But it also streamlines communication flow. We know when we had Hurricane Sandy, we had direct communications with CEOs in the Washington, D.C., area, but what we also needed was communications to the people in the field that were doing the work and prioritizing efforts. So this will allow us to have streamlined communication.

With respect to the priorities of the Department and the number of people, what we hope to do is build a capability and expand the mission within the Department of Energy, so utilizing the Department's staff as well as a couple of additional staff to fulfill that effort. We are looking at all kinds of options for supporting this mission, including the field offices, including supporting FEMA. And so I would like to talk to you in more detail or later to discuss some of the options we are considering in this need.

Mr. SIMPSON. One of the things that this committee is always looking at is not only, when we approve something, what it means in the current fiscal year but what it means in future fiscal years. Do you anticipate that aspect of this would be growing and a higher request, more personnel, in the future?

Ms. HOFFMAN. So depending on the path that we take, with the initial investment of staffing, we want to place at least one person, at each of the FEMA regions, whether it is at the DOE field office or at the FEMA site. Future needs will be dependent on how we look at utilization of the National Laboratories, and our DOE field offices in adding to our mission set, so we are looking at both options.

Mr. SIMPSON. Okay. Now the question for you, and this one has a little bit of a pretext for it so you will have to listen to this. But it is important to the question.

Earlier this month, several news outlets picked up on a Federal Energy Regulatory Commission, FERC, study that the entire U.S. electrical grid could be brought down by taking out just nine critical electric transmission substations out of the country's nearly 55,000. The FERC study has a powerful analysis that identified 30 critical substations under a stressed electrical grid, such as on a hot summer day. FERC found that taking out particular substations could lead to a national blackout in one scenario involving highly-coordinated small-scale attacks. FERC concluded that the entire U.S. grid could be brought down for at least 18 months by destroying nine interconnected substations, due in large part because so few U.S. factories build transformers.

Reports like these underscore the critical risk associated with the interreliability of our current centralized power infrastructure and the need to integrate the electrical grid. Can you discuss the Department's efforts to integrate its grid and to protect us against these types of physical attacks? Does the U.S. have an interagency process that adequately mitigates the risk to our current electrical grid, and what role does the Department of Energy play with the Department of Homeland Security utilities and the Federal Energy Regulatory Commission?

Ms. HOFFMAN. Thank you. Many questions there. With respect to the FERC report and the substation issues, it is important to understand that the grid can't be 100 percent secure. So what we have to do is look at all——

Mr. SIMPSON. It is a little scary when you are talking about nine, you know.

Ms. HOFFMAN. It is scary when you talk about nine substations, but the thing that I would like to point out is, the FERC study was a static study, and it was one scenario. The grid is very dynamic in nature, and it has protections built into the operation of the grid, the reliability councils. It is a very dynamic environment. So as we look at the infrastructure security, we shouldn't think about just one scenario. It is the operation of the grid as a whole. Going forward, we are looking at ways to protect the infrastructure. We are working with the interagency community and doing substation briefings across the United States with the Department of Homeland Security, the FBI, and FERC, and educating grid owners and operators of what happened at the Metcalf Substation, but also on the issues with substations.

In the past, we have been mostly worried about copper theft. In 2013, the dynamics in the United States changed with more of a focus on utilizing substations to send messages of people being frustrated, whether it be for different reasons, but for frustration. What we need to do is make sure that we are proactive. One of the things is hardening the system, looking at how can we just harden the system with walls, with protective measures that build security in the substations directly.

The second thing is, we know that some parts of the system may go down, so how can we quickly restore the system? Your reference to the transformers is absolutely critical. Transformers are the key component of this system. We need to have additional manufacturing capability in the United States. We need to develop advanced transformers. We need to look at technologies that can help with the transformer issues.

I will say, though, the difference between now and 5 years ago is we did not have any manufacturing capacity in the United States. So at least we do have some manufacturers that have come to the United States. The last component of what I would think our strategy should be is looking at new technologies. How can we make substations less critical? How can we look at additional protection schemes, power flow control in the system, and other advanced technologies that will help mitigate some of the criticality of some of those substations.

Mr. SIMPSON. Thank you.

Ms. Kaptur.

Ms. KAPTUR. Thank you, Mr. Chairman. I am glad you asked some of the questions of Secretary Hoffman. I was going to ask some of the same ones, so I will move on to Secretaries Danielson and Smith.

And before I do that, I would like to place on the record a story that was in an Air Force magazine back 2 years ago about Ohio's F–16s go green by using alternative fuels and a blend of camelina, and it was our unit, F–16 unit in the Ninth District of Ohio, that did this test flight with the Air Force research labs watching over their shoulder. And I do this to inform our witnesses that this actually occurred. The Air Force spends $8 billion a year on fuel. They are the largest consumer in the Department of Defense of fuel. And they actually lag behind the Marine Corps and other branches in trying to become more fuel-efficient. So we are really happy with this progress by Air Force, and I just wanted to bring it to the attention of the subcommittee, and of our guests today.

So I ask unanimous consent that it be placed into the record.

Mr. SIMPSON. Without objection.

[The information follows:]

OHIO F-16s GO 'GREEN' - Alternative fuel appears to be safe

Posted 4/1/2012 Updated 6/7/2012 Email story Print story

Like 1 SHARE

by Tech. Sgt. MARESHAH HAYNES
Defense Media Activity (AFNS)

4/1/2012 - **WRIGHT-PATTERSON AIR FORCE BASE, Ohio** -- In a joint effort by Airmen from the Air Force Research Laboratory at Wright-Patterson Air Force Base, Ohio, and Airmen from the Ohio Air National Guard's 180th Fighter Wing in Toledo, Ohio, the F-16 fighter jet is currently undergoing a field service evaluation of biofuel.

Photos 1 of 3

Biofuels scientist 1st Lt. Brett McNichols, at the Air Force research Laboratory checks fuel samples that have been sent in from all over the world on February 8, 2012 at Wright Patterson AFB, Dayton, Ohio. (U.S. Air Force Photo by: MSgt Jeremy Lock) (Released)

Download HiRes

As the largest consumer of energy in the Defense Department and $8 billion spent on fuel in fiscal 2011, Air Force officials are working toward making the fleet a little "greener" by researching, testing and ultimately implementing the use of alternative fuels.

Although other airframes, such as the C-17 Globemaster III, have been certified to use biofuel for unrestricted operations, this is the first evaluation of the F-16 Fighting Falcon.

Two F-16s from the 180th FW fleet have been designated to test the 50/50 blend of Jet Propellant-8 petroleum and Hydroprocessed Renewable Jet fuel derived from the camelina plant. Camelina is essentially a weed that grows throughout the United States and requires very little horticulture.

The 180th FW was an ideal location for the fuel test because of its proximity to Wright-Patterson AFB, where the Air Force Research Laboratory is located, and its continued focus on green energy. In 2011, the wing garnered the Reduced Energy Appreciation Program Award from the Air Force Civil Engineer Support Agency's Air Force Facility Energy Center.

"It's part of the Air Force's strategic goals to be able to reduce energy across the Air Force, so we really embrace that," said Col. Steve Nordhaus, the 180th FW commander. "We're trying to do everything we can to reduce energy costs because we know that every dollar we save there, we can use to buy more aircraft that protect our country or help support Airmen who are out there doing critical missions that affect our homeland defense." The jets have been flying with the blend since mid-December and will continue until the test sample is depleted, he added.

"Our ability to exercise and use this stuff on a smell scale or case-by-case basis makes us ideally suited to test the fuel," said Col. William Gieze, the 180th Mission Support Group commander.

The staff at AFRL worked with commercial fuel manufacturers to develop a blend that would meet Air Force specifications. Safety considerations such as the flash and freeze points of the fuel were some of the major factors when determining the specifications for the F-16.

"Manufacturers are making alternative fuels for both the military and commercial customers," said Dr. Tim Edwards, a senior chemical engineer for the AFRL fuels division. "Typically, they'll send samples of their fuel, and we'll evaluate and say, 'Yes, you're on the right track; this could be a jet fuel.' When they get to the point where they can make large enough quantities, we'll hand them off to the Alternative Fuels Certification Office."

The Air Force goal, by 2016, is to have half of the fuel that is purchased domestically to be at least a 50/50 blend of conventional and alternative fuel, Edwards said.

Another goal for the researchers and developers was to make the transition as seamless as possible. To date, there has been no additional training, equipment or maintenance required to begin using the fuel.

"When we first started this we were a little concerned because a few years ago we made the switch from JP4 to JP8 jet fuel," said Col. Scott Reed, the 180th Maintenance Group commander. "The difference between the two caused a few hiccups initially. Some of the gaskets and O-rings didn't expand as they normally would in the presence of the fuel, so we had leaks." The colonel likened the process to driving a car from Los Angeles at sea level to the Rocky Mountains. Adjustments need to be made for the car to operate at peek performance at different elevations. But with the new fuel blend, the transition has been totally transparent.

After each flight, the pilots complete a debrief form and each week the fuels technicians complete a debrief form to provide data to the Alternative Fuels Certification Office about how the jets are performing with the new fuel blend.

And just as in real world operations, the jets designated for the test can refuel from the same tanker as the rest of their fleet during mission. Since biofuels may not be available at every base or some overseas locations, the fuel blend must be interchangeable with standard JP-8.

"The truth of it is there has been absolutely no noticeable difference whatsoever," Reed said. "There have been no fuel leaks, no operational impact."

Once all of the data is collected and analyzed and any issues are rectified, the fuel can be certified to be used for all F-16s.

"The fact that we're going to be doing something that not only affects the Air National Guard, but the total force was really our end goal," Gieze said. "We really want to see the F-16 get certified on this and allow our country some other avenues for fuel."

Comments
No comments yet.

Add a comment

Inside Torch

Search
Search Torch
General Images Video
View All RSS

Ms. KAPTUR. And my question really goes to what is happening in different places in our country with adjustments in the private sector commercial energy industry? So, for example, for a coal-fired utility, Secretary Smith I don't really have a map of where all coal-fired utilities are that are being rotated off the grid and shut down. That would be a very interesting map to look at. And when I talked with Dr. Lyons about what is going on with the competition from natural gas to our nuclear facility, it would be interesting to see where, in an unregulated environment, those nuclear power plants are located. That would give you a sense of where there is fragility in the local economy related to energy. And in the bill that—the budget that you have come forward with, that the energy efficiency and renewable energy division of energy, you talk about certain programs like $14 million included for a competitive clean energy economic development and partnership program to assist regions in creating economic development roadmaps in sustainable shale gas growth zones, for example. I am interested in the Department of Energy stepping back from any particular program and taking a look at the impact of these major shifts in power production facilities, and even though shale gas may be coming on, it is not necessarily true that the economic impact of that, full economic impact of that, will accrue to the locality. A lot of that is being—the product is being shipped out or workers are being brought in from out of State.

So one of my concerns is how do we weather through in communities across this country that are seeing declining employment because of adjustments in energy? How do we help these communities and workers adjust? We are seeing this in coal country. We are seeing it, I mentioned the coal-fired utility shutdowns, we are seeing it in nuclear. Does the Department work across the Federal Government to try to help these communities adjust to that change? As you consider programs like your clean energy program partnership, do you think about how to work in those regions that are being hollowed out because—that it isn't your job directly, you think it will be somebody else's job, except it is happening so fast.

In Ohio, we face the bankruptcy of USEC. I don't know what is going to happen to all of those workers, but they are the highest unemployment counties in Ohio. These are adjustments because of what is happening in energy, and I am very concerned about what is happening in those communities and the people that live there. So could you provide some explanation of how you look at this or how you could look at this scenario connecting the programs over which you have jurisdiction?

Mr. DANIELSON. That is a really important question, and I—we have activities in this area, but I know we can do more and we can do better. To speak to the first question or comment you had around the shifting landscape, you know, one important activity at the DOE-wide level through the newly stood up EPSA office, Energy Policy and Strategic Analysis, which is the DOE-wide body focused on really developing comprehensive analyses related to energy, they are the executive secretariat for whole of government-wide quadrennial energy review, which is why I think, in 2015, will deliver its first results on really looking at energy infrastructure issues as it relates to the changing landscapes and what our future energy infrastructure issues are and ways that those can be mitigated. So there is a comprehensive whole-of-government approach underway through the quadrennial energy review right now.

You mentioned the clean energy economic development partnerships in our budget is an attempt to address exactly what you are talking about. We are looking at shale gas communities, you know, providing technical assistance to them through our extensive State energy network in EERE to enable them to do planning both for near-term infrastructure in the economic development issues that they are facing and also long-term issues to help them avoid the boom-bust cycle that you mentioned. And this is an area where it will be a DOE-wide effort, but leveraged through our State energy network, working closely with Secretary Smith and others to address that, and then that is $10 million in this budget request and there is $4 million to work with State and locals around economic development planning, around energy efficiency and renewable energy. And in recent years, we have used our State Energy Program Competitive Awards to fund regions to develop long-term economic development strategies that relate to the energy sector around energy efficiency and renewable energy technologies as well.

Ms. KAPTUR. What was the $10 million for, Dr. Danielson?

Mr. DANIELSON. $10 million for sustainable shale gas partnerships with communities, and then $4 million for engagement with local and regional leaders on their issues around economic development and energy efficiency and renewable energy.

Ms. KAPTUR. Thank you very much.

Secretary Smith.

Mr. SMITH. So I will perhaps just emphasize a couple of the points that Dr. Danielson made. Your question is a very broad one and an important one, and, you know, one of the things I would highlight is when we talk about an all-of-the-above strategy. We truly are trying to ensure that all of the components of energy security and diversity to energy suppliers are being focused upon. So you have got the four leaders of the applied departments here at the table in front of you, and we actually spent a lot of time together not only working on our individual programs, but also Secretary Moniz is broadening a new focus on crosscutting initiatives, which really brings together these four applied programs. So much of what I talk about in terms of safe and sustainable and reliable use of natural gas, ensuring that we are prudently developing our resources of trying to reduce the price volatility through good science to quantify the risks and concerns of unconventional gas and oil production, it directly affects issues of grid stability, directly affects competitiveness in the nuclear industry, directly impacts competitiveness of the issues that are of importance in Dr. Danielson's portfolio.

So we do truly have to work together. We want to make sure that all of these energy sources are available, and they are being put forward, and that is our focus. And we do that not only through our individual programs but also by working together appropriately.

Ms. KAPTUR. I am glad to hear about the crosscutting initiatives because I think the communities across our country that have bottomed out because of transition, somebody needs to pay attention.

Yes, Secretary Hoffman.

Ms. HOFFMAN. If I can just add to the conversation, I think it is very important that we work with the States on energy planning, and I think it is necessary as the States look at their future generation mix and understand the diversity of generation, it is important for energy assurance requirements for the State and the services they provide. As we move forward, what we are doing is working with the transmission operators and the reliability councils to make sure that we look at the reliability of the electricity system and the diversity of the resources. Part of that is the development of State energy assurance plans, and enhancing the resilience and the reliability through that energy planning activity.

Ms. KAPTUR. How is Ohio doing?

Ms. HOFFMAN. Ohio is doing fine.

Ms. KAPTUR. I have another question, Mr. Chairman, but I can save it for the next round.

Mr. SIMPSON. Go ahead.

Ms. KAPTUR. I wanted to ask Secretary Smith, could you give us a logical framework to understand what is happening with LNG and the possibilities of the legal requirements to only use it domestically versus the potential ultimately for export? I had an amazing conversation recently with someone, and I said to them the shortest distance between Northern Europe and the United States for the shipment of product is shipments through the Great Lakes, and they were very, very surprised. And to ports like Bremerhaven in Germany, a nation that has had a little bit of difficulty with us recently in standing strong with us—they finally are—in terms of standing up to what Russia has done in Central Europe.

And when you face an international crisis like that, is there anything in the authorizing legislation that would permit us to export, to take some of the pressure off of Europe, and how long would it take us to stage shipments? How would we evaluate? If we did, how would it harm the domestic industry? What is the framework in which Members can understand their latitude in voting one way or another on that?

Mr. SMITH. Well, thank you very much Ranking Member Kaptur for that question, and again, a lot of really big important themes there. So what I will try to do is give a broad framework of the regulatory, statutory responsibility of the Department compared to other agencies, a little bit about how we think about these important public interest determinations and then I will try to touch on current, you know, issues at home and abroad.

So section 3 of the Natural Gas Act dictates that the Department of Energy has to do a public interest determination for all natural gas that is exported to non-Free Trade Agreement countries. Essentially, that law creates, above presumption, that exports are in the public interest, which means for each individual applicant, we need to look at the application. If we determine that approving a given application would be deleterious to the U.S. interest and we are compelled to deny it; otherwise we are compelled to move forward.

For Free Trade Agreement countries, there is an assumption in the law, since those are defined as being in the public interest, so those are approved without delay or modification by the Department. Of note, essentially all of the major LNG importers throughout the world are non-FTA, non-Free Trade Agreement countries, with the notable exception of South Korea.

So, essentially, for all of the main importers of natural gas, we have to go through this free trade, we have to go through this public interest determination.

What the Department of Energy does is, we provide the authorization to export the molecule. What the FERC does, is they provide the authorization to actually build the terminals. So they are responsible for the footprint of the site. So can the site be built in a way that is staged and environmentally sustainable? So ours is the issue of whether or not gas should be exported. So, essentially, we are going through a—we have got a queue of applicants that are before us, you know, I will say just, you know, as caveat to that, or a prelude, just the fact that we are talking about LNG exports, you know, some of which will be coming from shale gas resources, really emphasizes the remarkable shift that we have had in our country in terms of going from scarcity to potential abundance. So we see that as being a truly important evolving marketplace. But in looking at each of the applicants, we are required to look at a number of public interest factors. We look at job creation. We look at environmental issues. We look at international issues. We look at balances of trade. We look at impact of prices on domestic consumers, be it American businesses, American families. We have to look at all of these things as part of our public interest determination. These are long-term, long-range considerations. These are decadal investments. They cost billions of dollars to build. They will be in place for tens of years. And so it is our process to make sure that we are looking at each of these on a case-by-case basis, that we are getting the analysis right. Each of these orders undergo an intense scrutiny in terms of looking at the rationale that we use to arrive at our decision. So it is our interest to make sure that we are taking the appropriate care for each of these analyses and that we are getting the decision right, such that we are putting out a decision that will withstand scrutiny and should we approve any given applicant, and thus far we have approved seven, that that applicant can then with confidence go and spend the billions dollars that they would need to spend in building a terminal because they are seeing an analysis that is done by the Department of Energy that is going to withstand this scrutiny that it is sure to receive.

Ms. KAPTUR. What would be the geographic distribution of those terminals?

Mr. SMITH. The terminals primarily are located in the Gulf of Mexico. There are some on the East Coast and some on the West Coast, but certainly, the Gulf of Mexico has been the primary location. The terminal that we approved yesterday was the first terminal that we approved on the West Coast, and that is in Oregon, that is Jordan Cove terminal so that is the first West Coast terminal.

Ms. KAPTUR. Where is that?

Mr. SMITH. Jordan Cove? In Oregon.

Ms. KAPTUR. In Oregon. All right, do you have any applications from the Great Lakes region?

Mr. SMITH. We do not. At the current time, we don't have any applications from the Great Lakes region.

Mr. SIMPSON. Would the gentlelady yield for just a minute?

Ms. KAPTUR. Yes.

Mr. SIMPSON. If you want to build an exporting terminal, who all do you have to go through?

Ms. KAPTUR. Yeah.

Mr. SIMPSON. How many permits do you have to get? How many agencies have to sign off on it? And I understand that Congress has recently authorized legislation—the Transportation Department is also involved in this, and have you or the Department of Energy had any coordination with the Department of Transportation on this? How complicated are we making this?

Mr. SMITH. So for the, again, this is the Department filling our role under current statute, so following the spirit and the letter of the law. There are two primary agencies that are involved, again, the Department of Energy that has the public interest determination about should the molecule be exported from the United States, and the FERC, which has——

Mr. SIMPSON. And you make that determination based on, levels of natural gas, and whether we have extra, so then we might as well export to a country that we like?

Mr. SMITH. So two things there: First of all, we look at a broad number of public interest criteria, everything from job creation to impact on prices to environmental issues to balance of trade, so international effect, so there are a lot of things we look at.

Mr. SIMPSON. Okay.

Mr. SMITH. Secondly, once an applicant has the right to export LNG, the applicant, the private sector, essentially, the company that builds the terminal has the control over the throughput of that terminal. That private-sector company makes a decision about where the LNG would go. So the government does not determine the destination of natural gas that is exported from the United States. That determination is made by the private sector.

Mr. SIMPSON. Okay.

Ms. KAPTUR. I wanted to just take 30 seconds to ask here, has the Department gamed the impact that exports to Europe to displace Russian gas would have inside our economy?

Mr. SMITH. Thank you for the question, Ranking Member Kaptur. A couple of points there: First of all, for all LNG exports, we do take a close look at impacts on the American businesses and the American families, on the price impacts that might be caused by that increased demand. That is one of the important things that we modelled, we look at and consider it in all of our applications, regardless of where the natural gas might be headed. And again, once an applicant is given the authorization to export LNG, that applicant then determines where that LNG goes. That is not determined by the Federal Government.

Secondly, you know, again, these are decadal challenges. They are multibillion dollar investments that will be in place for tens of years, you know, for decades. And so certainly, as you have prices internationally that require immediate response, you know, there are a variety of things you can do on that front, but when we are looking at our public interest determination, first of all, the gas that would be arriving anywhere from the world would be happening in 2016, 2017, for new applications that we would be approving having this current time frame.

So, overall, I think the important thing that I would like to emphasize is that for any applicant, for any molecules that leave the U.S., we do a broad public interest determination that looks at price impacts, regardless of where the private sector might decide to take that gas.

Ms. KAPTUR. What does it take in terms of money to build one of these staging terminals, and are any of them fully operational now?

Mr. SMITH. So there is one fully operational terminal in Kenai, in Australia—I am sorry, in Alaska. That is a terminal that has been in place for a long time. That is taking Alaskan gas, which is not connected to the lower 48, so that is sort of a different sort of market determinant for that gas because that gas does not have access to markets in the lower 48. There are terminals that are in the course of being built, but this is a new phenomenon, so literally, the terminal that is being built right now in the Gulf of Mexico, and in Louisiana, was previously an LNG import terminal and that was a terminal that was built with the idea of bringing in natural gas from other countries to serve the U.S. economy. Such has been the impact of the rise of shale gas here, that there are no LNG imports coming through that terminal, and now it is being repurposed for an export terminal and that is a multibillion dollar investment that is being made right now.

Ms. KAPTUR. Is that all private sector?

Mr. SMITH. That is all being done by the private sector. We do not make any investments. We simply do the public determinations to allow the companies to export the molecules.

Ms. KAPTUR. Thank you.

Mr. SIMPSON. Thank you.

Mr. Nunnelee.

Mr. NUNNELEE. Thank you, Mr. Chairman.

I want to continue the line of questioning brought up by Ms. Kaptur, dealing with economic development partnerships in these shale gas growth zones. I had a mentor in business who taught me early that if you fail to plan, you are planning to fail. And so I commend you for being forward looking and helping us make plans here.

I just have three questions for Mr. Smith and Dr. Danielson. Number one, what specific actions are you going to be taking to assist in these economic development partnerships? Number two, how will the communities be selected? And number three, how will outside stakeholders be able to participate in generating these roadmaps?

Mr. DANIELSON. Chris, I think I should take that one. So, in the near term, the kind of challenges that we are seeing some of these communities face relate to water treatment infrastructure, road infrastructure, and the impact that that is having on the communities. So that is one area. In the longer term, you know, I think it is about what are the other economic development opportunities for these communities to begin to plan for as the shale peaks and then ultimately trails off. So those are the kind of areas we will be looking at.

These will be competitive awards. You know, if appropriated, this program will have a series of stakeholder workshops to inform the criteria by which we would award these awards under this new program.

Mr. SMITH. And I will build on that. One of the challenges here is that, you know, first of all, when you look at the opportunities that come out of the development of shale gas, there are still some things that we have to focus on to make sure that the practice is demonstrated to be appropriate and that it is accepted in communities throughout the United States. And that is important work that we have to do. It is probably the most important thing that we can do to ensure that the resource continues to be abundant and that those molecules can get to consumers where they are useful.

What we see is that as practices move from places—so I grew up in Fort Worth, Texas, right in the middle of the Barnett Shale, which was not around when I was there. But in places where you have a history of oil and gas production, some of these practices are more easily assimilated into local communities. As you have opportunities to move that resource development into areas that are frontier areas, you know, perhaps some places like Ohio or Pennsylvania or elsewhere, you can have challenges in terms of demonstrating to those local communities that the concerns that they have are being taken seriously, that they are being appropriately mitigated through effective regulations and that concerns that communities have are being addressed by the producers and by the local regulators. That is important work that we have to do.

There are things that we have learned as shale gas is moved from one region to the other, that I think we can have a role in helping new communities, new local leaders, new mayors, new municipal leaders who are having to deal with the opportunities to pick up some of the learnings that we have seen in other parts of the country. So we will being looking at, you know, areas in which you have got new development, places in which we think that sharing best practices might be useful. This can be an important collaboration between government and private sector, between the Federal Government and local governments. And you know, we will be working together with the existing infrastructure that we have within EERE, and the knowledge and expertise that we have through the Office of Fossil Energy and the National Energy Technology Laboratory, to make sure that we are selecting areas where it is effective and that we are reaching out to communities and we have got a real two-way conversation.

Mr. NUNNELEE. All right, thank you. Do I have time for one more, or am I out of time?

Mr. SIMPSON. Go ahead.

Mr. NUNNELEE. Dr. Lyons, I have several questions relating to the Advanced Research Concepts Program, but in the interest of time, I will submit most of them for the record. But I do have one question. In your budget, you are changing the account title from Advanced Reactor Concepts to Advanced Reactor Technologies, and then they combine two older accounts. I understand this is going to give you some more flexibility. I just want the assurances that this is not going to allow you to shift money from Advanced Reactor Research to light water small modular reactor research without a reprogramming request.

Mr. LYONS. Thank you for the question, Mr. Nunnelee. We are interested in combining those two issues, because—or those two areas from the standpoint that as we look at advanced reactors, different coolants, for example, it is frequently a challenge to decide whether the concept, if it is fully fleshed out and eventually developed, will be appropriate to a small modular reactor or a larger reactor. And we had a somewhat artificial breakdown in the previous structure. Our intent is to focus that research primarily on non-light-water coolants, but included within that the general area of reactor concepts is the light water reactor sustainability program. That is a separate line. That continues. And the advanced reactors will be focusing on non-light-water coolants.

Mr. NUNNELEE. All right, thank you.

Thank you, Mr. Chairman.

Mr. SIMPSON. Mr. Fleischmann.

Mr. FLEISCHMANN. Thank you, Mr. Chairman.

Dr. Lyons, good to see you again.

Mr. LYONS. Yes.

Mr. FLEISCHMANN. The chairman and I have discussed the importance, Dr. Lyons, of investing in our nuclear facility infrastructure, and maintenance within the DOE complex. Could you please tell the committee—and I have a four-part question—what you see as the main needs for the nuclear energy infrastructure at Oak Ridge? And if those needs are being funded by this year's request, would you commit to working with me and Chairman Simpson on a path forward? And then lastly, what is your strategy for sustaining the nuclear infrastructure required to support the R&D agenda outlined by your organization, sir?

Mr. LYONS. That is a complicated question, Mr. Fleischmann, and one that probably does deserve a fair bit of discussion offline. Certainly, I would look forward to the opportunity to work with you and Chairman Simpson on the issues that you raise.

One of the areas of at least challenge in the question that you raised is that, as you are probably well aware, the space power activities have transitioned out of this budget into the NASA budget. In the past, when those activities were funded within the energy and water budget, that did include some of the radiological infrastructure, including at Oak Ridge. With the transition to NASA, it is going to require more coordination both probably between the Department of Energy and NASA as well as perhaps between your Appropriations Committees. But it is an excellent question, a complicated question, and one that I would be happy to continue to work on with both of you.

Mr. FLEISCHMANN. Okay, thank you, sir.

Dr. Lyons, by all reviews I have seen, the nuclear energy hub, CASL, at Oak Ridge has been doing quite well, and the project could be extended for an additional 5 years, sir. Are you pleased with the hub, and what are the next steps for renewing this hub? And as a follow up to that, would you also discuss the possibility of expanding high performance computing to support any of these programs?

Mr. LYONS. The proposed budget for fiscal year 2015, Mr. Fleischmann, does include funding to continue the CASL hub for an additional 5 years. Now, we anticipate that later in fiscal year 2014, this fiscal year, we will complete a careful review to make sure that CASL has met the various criteria that were laid out at the start that would be taken into account for continuation.

As you note, CASL has performed, in my estimation, extremely well. They have been very effective in their primary focus in bringing high-performance computational tools to industry. The industry involvement is superb, and their ability to transfer tools to industry has been excellent.

As far as additional high-performance computing, and modelling, and simulation, we also propose in this budget a significant expansion in the so-called NEAMS program, the Nuclear Energy Advanced Modeling and Simulation program, which I view as highly complementary to the hub or the CASL program. Within the NEAMS program, we developed the advanced tools which, in turn, transition to the CASL program for more involvement with industry.

Several different laboratories are involved in both NEAMS and CASL. CASL has lead to Oak Ridge, but other laboratories participate and in the NEAMS program. There are strong roles for Oak Ridge, Idaho, and Argonne are the three main contributors to NEAMS, but there are other labs that also have smaller roles.

Mr. FLEISCHMANN. Thank you, Dr. Lyons.

Mr. Chairman, I yield back.

Mr. SIMPSON. Thank you. This year's request includes a new crosscutting proposal to accelerate commercialization of electrical power generation using super critical carbon dioxide. As I understand it, this is a collaborative effort among the Offices of Nuclear Energy, Energy Efficiency and Renewable Energy and Fossil Energy for a total of $57 million.

The questions, and I will ask all of them, and then we can go down the line: Dr. Lyons, your office budget request includes $28 million for a pilot demonstration project, and $3 million in research for this effort. Can you explain to us how this technology is important and, if successful, the impact it will have on making electrical power generation more efficient, and how quickly would the Department proceed with this demonstration project in fiscal year 2015 if it were approved, and what type of technologies are you most likely to consider? And can you explain why the pilot demonstration is in your office's budget and not, say, in EERE's?

Dr. Danielson, as I understand it, there is also $25 million in your budget for this initiative within the solar energy program. Can you explain what this research funding will support, and how you plan to collaborate with the Office of Nuclear Energy in this respect.

And Mr. Smith, if successful, this program would seem to have a transformational impact on improving the electrical power generation of natural gas-fired power plants, yet your office is only investing $2 million into this crosscutting research. Can you describe what your research will support, and how would you propose to spend additional funds if they were provided for this initiative?

First, Dr. Lyons.

Mr. LYONS. Thank you, sir. An important question and that is a very important program. In past years, there have been activities within three offices that you outlined, and while there has been some degree of coordination among the offices, our intent with this proposal is to bring about a much more focused coordination among the efforts in the three offices. This is another example that is referred to earlier of the Secretary's very strong interest in looking at crosscutting technologies that have impact in a number of different areas.

Super critical CO_2, so-called Brayton cycle, has the potential to increase the power conversion efficiency very substantially. Right now, with nuclear power plants, light water coolants, our conversion efficiency of heat to electricity is about 33 percent. Using the Brayton cycle with super critical CO_2, and with advanced reactors, we anticipate raising that up into the range of, perhaps, 45 percent or even higher. That is a very, very substantial improvement in the conversion efficiency and, therefore, the overall efficiency of producing electricity.

The funding probably could have been placed within any of the three offices. However, we have had a strong effort within the Office of Nuclear Energy in the past in the Brayton cycle work. So has Dr. Danielson in his office. The intent is to coordinate this very completely among the three offices and to assure that any activities that are taken, some that are specific to our interest in nuclear energy, or EERE, perhaps, for Dave's programs, that funding is within each office. But then the demonstration program is the $27 million that is proposed for the step crosscutting initiative, within NE, but that will lead to a demonstration that will benefit all three offices and allow us to hopefully prove that this technology can advance in America.

This is another example of an area where there is an opportunity for American leadership in an important energy field. And one of the goals of this program is to encourage U.S. energy, U.S. energy companies, through cost sharing with us in this demonstration to advance and move ahead, hopefully to build U.S. competitiveness in what we think may be a very important new approach to power conversion. Maybe that is enough for my office, and—

Mr. DANIELSON. Thank you for your question, Chairman. I think we, you know, anything like this you need a good solid leader, so we are seeing the nuclear office as it really is taking a lead role here in this cross cut with the rest of us working collaborating very closely. You know, the demo occurring in nuclear is going to be a really important full system scale demonstration in addition to the nuclear-specific R&D. The focus at EERE, you know, so this effort, you know, increasing the thermal to power conversion efficiency for concentrated solar thermal plants is critical for us to achieve our 2020 goal of having directly cross-competitive concentrated solar power by 2020. And our efforts are really going to focus on research and development of components at the—that would be relevant for the 10–megawatt scale that are more specific, that are quite specific to our unique application requirements, which are higher temperatures, in particular, and also the requirement that we have high temperature receivers that are going to actually receive the concentrated solar power and be able to transfer that to energy storage media. And so the high temperature components, we are looking at higher temperatures than the nuclear office, in addition to the integration with solar receivers and with thermal energy storage materials is going to be a big part of what we are developing. I think with the system level demonstration innovation that nuclear is going to demonstrate, you know, after this 3–year program, we will be able to evaluate whether this technology is ready to hand off completely to the private sector or whether further government involvement is required.

Mr. SIMPSON. Mr. Smith.

Mr. SMITH. Well, thank you, Mr. Chairman, for the question. The Office of Fossil Energy is currently managing eight major demonstration projects that are at various levels of development throughout our portfolio. We certainly could have, you know, potentially managed another one, but we would be, will be working very closely with the Office of Nuclear Energy. We think this is a great place to put this particular demonstration. As Dr. Lyons mentioned, the advanced supercritical and the Brayton cycle is applicable to a broad range of technologies in terms of increasing efficiency. So we have got some work that we are going to be doing that is supplementary to the demonstration that is going to be managed in the Office of Nuclear Energy. We are going to be looking at ways of implementing these results and pressurized oxy-combustion applications for fossil energy power plants. So we are going to learn a tremendous amount from the work that is being pioneered by the Office of Nuclear Energy, and on our side, we will be doing the appropriate complementary research so that we can take the learnings there and apply it to ensuring that we are increasing efficiency and safety and reducing emissions from coal-fired power plants.

Mr. SIMPSON. Thank you. Another issue that is kind of cross cutting, I guess, but a key challenge for energy systems of the future is the potential for development of hybrid systems, coupling a nuclear power plant with another energy system to balance the disparities between production and demand. This model would enable the integration of various energy technologies into a single system to create efficient, stable deployment of renewable energy, while expanding nuclear energy beyond baseload electrical generation. I understand the Office of Nuclear Energy and the Office of EERE are in the initial stages of collaboration on such a project.

Would Dr. Lyons and Dr. Danielson like to discuss that for a moment?

Mr. LYONS. Yes, Chairman Simpson. You described it very well. And there is very strong interest, I think it is fair to say, in both of our offices. Both of us have been encouraging that this work proceed between NREL and INL. I think we are in the process of changing the name of hybrid energy systems to actually another word that you used, of integrated energy systems. And I think, in general, the idea of viewing energy systems as moving outside the box where you think of nuclear as just electricity or renewable as just electricity and, instead, asking how for that particular example—but it could be other examples—renewables and nuclear can work together in order to provide a range of products on the output, not just electricity, but maybe liquid fuels or maybe hydrogen.

We think it is a possibility. It looks very good, certainly in paper studies. We are continuing that. And other labs have expressed substantial interest in also joining in this work as well. So I anticipate that this will be further broadened.

Mr. DANIELSON. And just to add a little bit more, you know, we are absolutely supportive of this partnership, and it is a great example of crosscutting partnership between our National labs, in particular, Idaho National Lab, and National Renewable Energy Lab, and it is going to leverage the investment supported by this committee and the energy systems integration facility at the National Renewable Energy Laboratory, which is going to be a great facility to allow for collaboration with some of the very advanced work that has been going on at Idaho National Lab, looking at nuclear integration of the energy systems, to break down the barriers between electricity infrastructure, thermal infrastructure, and fuels infrastructure.

Mr. SIMPSON. Dr. Lyons, last year, we, as you know, transferred safeguards and securities at the Idaho National Lab to your Department. Although it has only been a few months, how is that working out?

Mr. LYONS. First, thank you very much for the committee's action in making that change. I believe that gives us far more flexibility in optimizing the overall needs of the Idaho National Laboratory, and that safeguards and security is absolutely essential, of course, if we are going to be running a laboratory, and that lab, INL, has a substantial number of safeguards and security challenges that have to be appropriately met. We appreciate the ability to have a little bit more control by having it within the Office of Nuclear Energy, although I believe it still stays in an 050 account, but it gives us considerably more flexibility. We appreciate it, and we believe that this will result in a stronger and well—and better integrated approach to safety and security at the Idaho National Lab.

Mr. SIMPSON. Okay, the fiscal year 2015 budget proposal requests an increase of $90 million for the Used Nuclear Fuel Disposition subprogram, which is prepared to examine dry cask storage at the INL. Please describe in more detail the purposes of this funding and what the Department's goals are with respect to developing capabilities to examine and evaluate spent nuclear fuel contained in dry storage casks.

Mr. LYONS. Thank you also for that question. A very important effort, well underway within the Office of Nuclear Energy now, is to develop a stronger and better understanding of what could be degradation mechanisms for fuel that is stored in dry casks. This is already moving ahead with the strong industry involvement and will result in dry casks with so-called high burnout fuel in dry casks and being carefully monitored over a period of many, many years. In order to do that monitoring, although we will put some instrumentation within the casks, there is going to be a need to open those casks under a dry environment. And in general, when such casks are handled, they are handled under water in anything but a dry environment. But we must develop the capability for dry handling of the dry casks, keeping them dry, and then being able to evaluate any changes in the fuel structure.

Idaho has some facilities, so-called INTEC facilities, that we believe can be modified to open a dry cask in a safe configuration that has a potentially very high radiation environment, has to be done very, very carefully, but there are facilities in Idaho that we believe can do that and the capabilities at Idaho for post-irradiation examination will also be very important in allowing us to take samples of that fuel as it has been stored for years, or decades, and then carefully evaluate any structural changes in the fuel.

So it is an extremely important program. We are looking forward to a key role for Idaho in this project.

Mr. SIMPSON. Thank you. One last thing from my perspective, and then I will turn to Marcy for any questions that she has left.

But Dr. Danielson, I want to read you a paragraph from your testimony that you wrote, I suspect. And you mentioned part of it there in your testimony—I don't know if it was the whole paragraph or not—and then ask you about it. It says, "The United States has world-class innovation capacity, a unique culture of entrepreneurship, well-developed capital markets, and the finest scientists, engineers, and workers in the world. However, despite this tremendous opportunity, the U.S. energy industry is systematically underinvesting in research and development (0.4 percent of sales versus 12 percent for the aerospace/defense industry, 20 percent in pharmaceuticals, according to one estimate). This significant underinvestment in energy research and development by the private sector, in spite of the highly strategic importance of energy to American economic growth, energy security, and the environment, makes government support for applied energy R&D critical for our future competitiveness and economic prosperity."

You and I have talked about this in the past, and I suspect you know what the question is. It sounds like if a sector of our economy underinvests in its own future, it is an opportunity for the government to step in and do it. Why wouldn't the aerospace industry or any other industry that you have mentioned here, pharmaceuticals or whatever, say, Well, let's stop investing because if we do, it is critical; the government will step in and fund it. Why isn't the energy sector investing in the research and development that other sectors of our economy are, and is the government taking its place for the private-sector investment? And how do you decide when you decide what you are going to do, whether this is something that the private sector should really do or whether it is a government responsibility or something that we can just lend a hand in?

Mr. DANIELSON. Mr. Chairman, that is a great question. It is very important, and you know, I have enumerated for you the five core questions that drive our decisionmaking, our prioritization at EERE, one of which is additionality. You know, would the private sector invest in this area already? Is the private sector or other agencies already investing sufficiently so that it wouldn't be a high-impact opportunity for EERE to invest taxpayer dollars?

And then one of the other five core questions is the proper role of government. So is this a high-impact proper role of government versus something best left to the private sector?

I come from the private sector. I was a venture capitalist before I came to the Department of Energy, so I am very familiar with the operation of the private sector and industrial technologies and in energy technologies, which are, you know, generally large-scale, you know, kind of industrial technologies.

You know, an MIT study on the production of the innovative economy recently came out and identified that over the last 25, 30 years, there has been a systematic reduction in the long-term R&D in our large industrial companies for a number of reasons, one of which was a move toward the financialization of corporations where they were no longer thought of as a kind of long-term entities that would keep their employees for a long time and would be able to monetize a lot of the benefits of the research, and resulted in a kind of a loss of our industrial commons to a large extent, and so, you know, we work very closely with our stakeholders and others to identify where they are making their investments, you know, and where they see that they are not able to make investments in the private sector. And we really emphasize problems that are both high impact and where there is high additionality. But I think you make a very important point that I take to heart, that government has to be very careful about displacing private-sector funding when it makes these kind of decisions.

Mr. SIMPSON. Well, and I appreciate that. And we have discussed this a couple of times in my office. I am one that believes there is a role the government can play in advancing a lot of these things. And I think Marcy would agree that we hear on the floor repeatedly that the government shouldn't be involved in a lot of different things. And the private sector should take it over, and all we are is displacing private-sector dollars. And that is an argument that continually hits us. So when we have these different types of investments, even with nuclear energy, or other things, we have to be able to explain to our colleagues and others that this is an investment that government ought to properly make. So I appreciate your answer on that.

Ms. Kaptur.

Ms. KAPTUR. Boy, I could make a lot of comments.

Mr. SIMPSON. I know. I know you could.

Ms. KAPTUR. If the private sector had done such a good job, we wouldn't be importing $2.3 trillion. If you look at amount of imports in energy over the last decade, the current system we have has placed America at an enormous risk. And it isn't just risk at our generating facilities or our transmission facilities, but it is the blood, the sort of the energy blood that flows through us is all transfusion, and that is not a healthy position for the United States.

In fact, I was sitting here thinking about President Jimmy Carter. I served President Carter in the White House during those years, not as his energy advisor, but you couldn't possibly serve during those years with the first Arab oil embargo and not be completely transformed as an American.

And I was thinking about him and the Department of Energy and looking at all of these photos up here as you are testifying and thinking about how far we have come as a country. We can at least talk about the dimension of the challenge, and how far we have come. We have some quantifiables now. And I was thinking about each of you, what an excellent team you are for our country, and thinking what exciting jobs you have and inventing the future. Not every American——

Mr. SIMPSON. I bet they sometimes don't think it is like that.

Ms. KAPTUR. I am sure. I am sure. But really, how few Americans ever have the opportunity to do what you are doing, and what a tremendous responsibility you have, and how very very important what you are doing is to the country. And we still aren't, in my opinion, close to the finish line. We haven't—we are not at the goal. We are not at the goal post. That is for sure. But at least we have some sense of direction, and we are trying to work together.

In that regard, I wanted to ask you, Dr. Danielson, if I asked somebody in the Agriculture Department, you know, where do you produce soybeans, they can give me a map right down to the acre, and how much per bushel production has increased over some period of time. If I were to ask you for the manufacturing sector, and I am very grateful for the Department of Energy and its focus on the National Network for Manufacturing Innovation, but if I were to ask you for a map that would show me on the industrial side the relative importance of industrial firms that suck energy from our grid, wherever it might happen, could you provide me that kind of visual?

I can't believe—well, now that we have got all of these semiconductor, Google and all the rest, sucking up a lot of energy, I would be really interested, for instance, how my part of America and the industrial spine district that I represent compares to the Everglades. I don't have any such information that has been made available to me. It would be most interesting to compare, for example, ArcelorMittal in Cleveland, and Alcoa, their 50,000 press, 50,000-ton press, and the energy users along the corridor that I represent versus some other part of the country and trying to understand a little bit about, okay, so we are here today, and if I wanted to—if I really wanted to help those companies become more competitive, how do I think about that? We talked to several steel companies this morning about becoming more energy independent. How do we do that? How do we help them become more competitive? Have you ever seen such a map at the Department of Energy? Is there some kind of a—I don't even know what to call it—user, energy user map of industrial companies with our part of America, would the Great Lakes region light up compared to Idaho? I think it would.

Mr. DANIELSON. It is a great question. I don't have that map, you know, fully developed today. But it is definitely something we could develop that would show the industrial energy usage by State and in addition to industrial energy prices.

But what I will point out is that, you know, in our vast manufacturing office, we have a major effort to help energy-intensive industries reduce their energy costs by—actually visited ArcelorMittal and Alcoa to be part of an in-plant training, where they were teaching each other some of the best solutions that they had achieved. And through our Better Plants program, Better Plants Challenge program, since 2010, our partners have lowered their energy bills by more than $1 billion.

But also on the research and development side of the Advanced Manufacturing Office, we are looking to prioritize the kind of high-impact opportunities that will help, you know, large industrial players and large energy users lower their energy costs and be more competitive.

Be more than happy to follow up with you to deliver on this map.

Ms. KAPTUR. I would be very interested to look at the geographic distribution of this. And to think about how do we make that corridor competitive where we have corridors. Not every part of America has a corridor. But, you know, when you are building an Abrams tank, you use a lot of energy. It's a little different than if you're sewing pajamas. I mean, there is a difference there.

Mr. SIMPSON. Use a lot more horsepower. Horses.

Ms. KAPTUR. In talking to several automotive manufacturers, they can point to where they have problems, you know, put paint shop in this place or stamping over here. So I am just real interested.

I am not sure where the map will lead me, but I would sure be interested in looking at it.

I would ask for the record if you could provide information about what has happened to the Department of Energy support of biorefineries. Secretary Chu, when he was Secretary, and Secretary Vilsack from Agriculture, announced three biorefineries around the country several years ago, let's say 6 years ago, whenever it was. So what? Okay. So we did it. They are under way. What have we learned from that? Be really great to have something back to the record on that.

Mr. DANIELSON. Absolutely.

Ms. KAPTUR. I wanted to ask Dr. Lyons also whether the Department maintains any bilateral relations with Ukraine on Chernobyl and Japan on Fukushima.

Mr. LYONS. Yes.

Ms. KAPTUR. And if you look at what happened, if there is any way you could condense what we have learned in terms of environmental degradation, cleanup, zones of—where you can't really still go into—I would be very interested. I haven't seen reports on that. If you could provide that in some way?

Mr. LYONS. We can certainly provide some information. We don't actually have reports. But we will certainly provide what we have. And we are very, very active in Fukushima-related activities.

Ms. KAPTUR. What about Chernobyl?

Mr. LYONS. Chernobyl, not to any substantial extent. There are a number of U.S. companies involved in Chernobyl. I am less sure that there is work within my office. Now, there has been other work within Ukraine on providing fuels and improving safety of Ukraine's power plants. But I would have to check on Chernobyl. I am not sure that we have been directly involved there.

Ms. KAPTUR. Like, you know, what are the long-term consequences of what happened there. So if you could dig around a little bit, I would be really interested in human health impacts as well as environmental, and what is being done technologically to either cap or contain or whatever at this point so many years later.

Mr. LYONS. We can certainly provide some information along those lines. Some of this also would be within our environmental management program——

Ms. KAPTUR. All right.

Mr. LYONS [continuing]. That has some interactions, both at Fukushima and Chernobyl.

Ms. KAPTUR. I think it would be important for the world to know.

Mr. LYONS. I would be happy to talk in great detail about what we know about Fukushima and the causes and effects.

Ms. KAPTUR. Very good. I wanted to ask just two more questions. One everybody can be thinking about as I direct my last question to Dr. Danielson.

Each of you works in a really exciting part of the future. And think about some innovation you could talk about here today that you personally witnessed as a result of your work that you knew was going to carry America forward into a new age. And share it with us. And share it with those who will read the record here today.

But my question to Dr. Danielson, as you all are thinking, is, you have made a proposal for a National Network for Manufacturing Innovation. And I am interested in some of the topical areas that the Department has focussed on. Could you discuss that a little bit, and will there be additional topical areas that the administration will select? And how will you work to make sure there is no duplication with other Federal agencies?

And how long do you think these partnerships will last?

Mr. DANIELSON. Great. Thank you for that question. So the National Network for Manufacturing Innovation is a centrally—coordinated by the Advanced Manufacturing National Program office in the National Institute for Science and Technology—for Standards and Technologies, NIST, and Commerce.

And so they really are pulling us all together, all the agencies, to ensure no duplication, to make sure we have best practices. These are meant to be 5-year, $70 million awards. And at the end of 5 years, our expectation is that these facilities, cutting-edge emerging manufacturing facilities, should be transitioned fully to private sector support. That is kind of the nature of these funding areas.

So there are a number of areas that we have under consideration. Just brought in a new advanced manufacturing office director from ARPA–E, who is going to be doing a series of stakeholder engagement workshops, requests for information, over the next 6 months to identify a set of high opportunity topics that we will then workshop out with key stakeholders.

Areas of interest include roll-to-roll manufacturing for battery technology, for membrane technology, for efficient separations for fuel cell membranes and other areas; process intensification to enable chemical industry to dramatically lower their energy footprint; applying big data, high performance computing, and smart manufacturing to energy intensive industries to dramatically lower their energy footprint; and a number of other areas that I would be more than happy to submit for the record to the committee.

Ms. KAPTUR. Thank you. And if we could just go, something you have seen that maybe the average American hasn't seen that you would view is an innovation that you have witnessed, maybe something that is not completed but in process that you think will be really transformative. Doctor.

Mr. LYONS. This committee strongly cites the NP 2010 program that enabled a new generation of passively safe nuclear reactors to be licensed. That has led to the Westinghouse AP 1000 reactor, which is passively safe. Under construction the United States, China, will be constructed in the U.K. Was being viewed in a number of places around the world. That program also supported a General Electric passively safe design that I hope will also achieve design certification.

"Passively safe" means that in an accident scenario, you do not require the operator to do anything quickly. In an actively safe plant, the operators are trained, but they have to respond within time scales of half an hour. An AP 1000 Westinghouse plant requires no operator actions for 3 days. The SMRs, small modular reactors that we are supporting, the mPower requires no operator action for a week, NuScale requires no operator action, period. Indefinitely.

Those are dramatic changes in nuclear safety.

Mr. DANIELSON. The technology I would put forward is an area of next generation power electronics based on a new generation of semiconductors beyond silicon, which is a traditional material we have today in all of our phones. So silicon carbide, gallium nitride, these are areas the Department of Defense invested in materials development for a couple decades. And now through—and manufacturing innovation we are helping bring this next generation, very efficient, very low cost power electronics technology to a wide array of applications.

One very exciting application is in variable speed drive motors. Maybe it doesn't sound like the hottest topic ever, but more than 40 percent of the electricity we use in this country goes through motors. And we can reduce the energy usage of an industrial motor by 40 percent with this kind of technology. So this technology alone, that application alone, could lower our electricity usage by 10 percent. But it is also used in next generation electric vehicles, solid state transformers, which would you think of as, like the next generation Internet router for the grid, and a number of other high impact applications.

Ms. KAPTUR. Thank you.

Ms. HOFFMAN. Thank you. I appreciate the opportunity to talk about innovation because most of the time I talk about what scares me at night or keeps me up at night. So I appreciate the opportunity.

One of the things that this committee has invested in is information technology for the grid, which I think has opened a huge opportunity for development both on the transmission and distribution system.

What we have done is we have placed sensors—I should back up. In the 2003 blackout in the Northeast, there was a recommendation that came out of that followup report that the system needed wide area visibility, that grid operators needed to be able to talk to each other during an emergency, during an event.

What we have done is we have placed over a thousand sensors across the transmission system. We are developing real-time visualization technologies for grid operators to see what is happening to the system to be able to understand the characteristics of the transmission system so that they can proactively mitigate any sort of disturbance that has occurred.

Having that access to the information technologies and more transparency of data and information across the electric grid has led to a series of innovations. But that is one that I am particularly proud of.

Mr. SMITH. Thank you very much for the question.

So I would highlight the work that we are doing in our Office of Clean Coal in terms of working to reduce the cost of capture out of existing sources of carbon pollution. And ensuring that all of our sources of energy are going to be relevant to the clean energy economy of the future. So we are doing tremendous groundbreaking work in terms of sponsoring major demonstrations to accomplish those things around capturing CO_2 that is coming out of coal fire power plants. That does a couple of important things. First, it ensures that we have got a diverse source of energy, not only now, but also in the future for American businesses and American families.

And also, if—you know, an important thing for us is that if you care about reducing carbon pollution, if you care about tackling the problem of anthropogenic CO_2, doing something about climate, then dealing with CO_2 that is coming out of coal fire power plants, not only domestically but abroad, is something that is tremendously important. So we think that in the global clean energy economy of the future there is going to be two types of countries, going to be those countries that invest, that innovate, that create the new technologies, and then there are going to be those countries that buy those technologies from the first category.

So we are very much in the first category. We've government great collaborative partnerships between government and industry. We are working with companies like Southern, with Archer Daniels Midland, with Air Products, with Summit Energy. And we are making great progress to not only showing the feasibility of these concepts, but also to drive down the costs and make sure that they are applicable to the challenges that are facing us. So I think that is tremendous work that the Department and the National Energy Technology Laboratory is leading on a global scale.

Ms. KAPTUR. Thank you.

Mr. Chairman, I just have to say for the record I don't know about Idaho, but for the region that I represent, what has happened in my lifetime is a complete transformation in the way that we produce energy. So, for example, when I was growing up, we had a locally-owned Edison company that got its coal from southern Ohio. And it brought it up. And we had a massive power plant down to the river. It drew the water from there with big stacks. And all of the people that built the plant and worked in the plant and repaired the lines were all from our community. And there was a lot of local capability. We may not have had the most clean producer, but it was local.

And what I have seen happen over the years is a transformation to where now the actual control, command and control sits in New Jersey. And the original facilities are being dismantled or have been dismantled. So all the skills that went with it have migrated and transformed. And our power—we are dependent on, I would say, in some cases, distant producers or producers where the talent is located far away from our region.

I don't know what that means across America. But I am just not somebody who is comfortable with things that are so far away. And I like to in-source talent, I like to in-source material control and so forth. Because wealth creation then accrues with that.

And so sort of like our airports, you know. You have to go to these huge airports now, and our medium-size and smaller airports have been diminished in the national context. It has been a real big transformation since World War II. And it is just the way we do things now, but I can see the change, I have lived the change. And I am concerned about distant control over life in given places and the ability in the event of tragedy or difficulty the ability of local communities to respond, and what happens in that regard.

So I just wanted to place that on the record and thank the witnesses this morning. Mr. Chairman, you have been very fair with the gavel and generous with your time. Thank you.

Mr. SIMPSON. Thank you. Thank you all for being here. I don't know if it was the first law or third law of dynamics or something that was for every action there was an equal and opposite reaction. Something like that. Just remember, when you are out making cars more efficient, fuel efficient, with better batteries, all those improvements, you are screwing up our funding source to pay for those roads. We have to find a way to do this.

But anyway, thank you all. Thank you for the job you are doing. Be sure that you get the questions answered back to us within 4 days because we are going to be marking up fairly early this year, and we do want your responses so that we can take those into consideration as we do markup.

Thank you all very much.

QUESTIONS FOR THE RECORD

SUBCOMMITTEE ON ENERGY AND WATER DEVELOPMENT
HOUSE COMMITTEE ON APPROPRIATIONS

ENERGY EFFICIENCY AND RENEWABLE ENERGY, ELECTRICITY DELIVERY AND ENERGY RELIABILITY, NUCLEAR ENERGY, AND FOSSIL ENERGY RESEARCH AND DEVELOPMENT FISCAL YEAR 2015 BUDGET HEARING

MARCH 25, 2014

ENERGY EFFICIENCY AND RENEWABLE ENERGY

ADVANCED MANUFACTURING PROGRAM

INNOVATION MANUFACTURING INITIATIVE

Subcommittee. Dr. Danielson, the Innovative Manufacturing Initiative (IMI) has been a major feature of the Advanced Manufacturing budget request since fiscal year 2012. It was an "open opportunity" for companies, universities, and labs that want to make improvements in manufacturing processes, but also an experiment for your office, since you hadn't made this type of solicitation before.

I understand you've awarded several rounds of grants under this initiative. How is the program doing, and what have you learned about its potential for success?

Dr. Danielson. The Innovative Manufacturing Initiative (IMI) was announced on June 24, 2011 to address core technical issues for foundational technologies in manufacturing materials and processes that could enable U.S. manufacturers to realize significant gains in energy productivity, environmental performance, product yield, and economic growth. A total of approximately $120 million in DOE funding was expected to be available for awards contingent on federal appropriations.

Initial IMI award selections were announced on June 12, 2012; the initial 13 awards total $54.3 million in DOE funding. These thirteen IMI projects target precompetitive manufacturing research and development (R&D) activities, ranging from the early stages of applied research (proof-of-concept) through laboratory testing and verification. A second round of IMI awards from the original funding opportunity announcement (FOA) was announced on March 26, 2013, which included five additional awards totaling $23.5 million in DOE funding. These projects include further manufacturing R&D in specific topics ranging across computational modeling and simulation for automation and equipment, steel fabrication processing, steel heat treatment processing, high value chemical intermediates processing, and waste heat minimization in manufacturing. The projects were selected based on rigorous technical merit review and have shown great potential to increase manufacturing competitiveness and industrial energy productivity through potential advances in specific technologies and processes. Each of these research projects has rigorous milestones, and through active program management, these teams are moving forward on their research plans. There have been individual research successes, and where appropriate, some of the project teams are pursuing intellectual property protection before publicly releasing the results.

Subcommittee. What are some examples of research projects under this initiative, and how will these projects help American manufacturing?

Dr. Danielson. Selected IMI projects have shown great potential to increase manufacturing competitiveness and industrial energy productivity through advances in specific manufacturing technologies and processes. For example, one selected IMI project should directly impact the energy productivity in the production of steel. This novel flash iron-making process proposes to reduce energy consumption and greenhouse gases compared with blast furnaces and coke ovens. Another selected IMI project supports the development of a Smart Manufacturing (SM) platform that integrates information technology, performance metrics, and models and simulations driven by real-time plant sensor data, allowing manufacturers to optimize energy productivity in real-time, and, in turn, reduce waste and improve energy efficiency up to 30%.

Subcommittee. As I understand it, this year's budget includes funding for a new solicitation of IMI funding, is that right? Can you tell us how you're planning to finish off the old round of solicitations, and the technologies you're going to focus on in the new round?

Dr. Danielson. DOE will continue to support awards from the previously selected 18 IMI projects from 2012 and 2013. In FY 2014, DOE's Advanced Manufacturing Office (AMO) is updating the IMI technical review in a process that has already included a request for updates from the applicants consistent with the constraints and intent of a fair and open solicitation process. AMO is also reviewing the proposals for the effects of changing technology or market developments since the original proposal submissions, to determine suitability for selection. Additional IMI projects are expected to be announced in FY 2014. Selections will be made from IMI non-selected, alternate proposals identified through the IMI FOA previously and will be made based on technical merit. Any award announcements will be made once this updated review is complete in the very near future.

No additional funding is required in FY 2015 for the multi-year projects awarded under the previously issued IMI FOA. Each IMI project has been supported in full from the available appropriations at the time of announcement. Separate from the previous IMI FOA, the FY 2015 Budget request does propose funding for three to four new R&D project FOAs at approximately $20 million each to address specific high-impact manufacturing technology and process challenges. These foundational technology areas will be selected from the results of technology analyses, an ongoing series of technical workshops, and by soliciting input from the external stakeholder community through targeted requests for information (RFI). Candidate technical topics in any new R&D FOA would be selected based on the consideration of energy, environmental, and economic impacts; additionality relative to existing public and private sector investments; openness of the stakeholder community to new technologies; degree of technical uncertainty and risk limiting potential private sector investment thereby providing an opportunity for a catalyzing influence of public sector investment; and opportunity for long range impact of the technology through domestic manufacturing.

ADVANCED MANUFACTURING AND THE PROLIFERATION OF CENTERS

Subcommittee. Dr. Danielson, this Committee has been very supportive of the Advanced Manufacturing program. In fact, last year's omnibus appropriations bill included a $70 million increase for the program. I do have two particular concerns I'd like to raise with you, however.

In last year's hearing, as you may remember, we discussed how the Advanced Manufacturing program seemed to be getting bogged down with far too many centers of various kinds. For example, last year this program supports the Critical Materials Hub at Ames Lab in Iowa, the Manufacturing Demonstration Facility at Oak Ridge, and a joint additive manufacturing pilot institute with the Department of Defense in Ohio.

Since then, the White House has announced a number of new initiatives to support and revitalize American manufacturing, including the establishment of three Clean Energy Manufacturing Innovation (CEMI) Institutes within your office. Each of these institutes is a 5-year, $70 million commitment, and your office has committed to three of them this fiscal year, and the budget before us proposes a fourth. In fact, this budget request includes $191 million just for facilities within this program, up from just $82 million this year.

The budget requests have been thin on details for CEMI Institutes. Can you describe for us how these will fit into your Advanced Manufacturing portfolio? How will they make manufacturing more competitive here in the U.S.?

Dr. Danielson. The Clean Energy Manufacturing Innovation Institutes are designed to focus on foundational technologies that are broadly applicable and pervasive across multiple industries and markets, with potentially transformational technical and manufacturing productivity impact. Institutes will be partnerships between government, industry, and academia, supported with cost-share funding from Federal and non-Federal sources. Within 5 to 7 years of launching, each Institute is expected to be financially sustainable from private sector investments and other sources without further direct funding from the Federal Government, and the multi-year award funding profiles for the Institutes will reflect this expectation.

For example, the Next Generation Power Electronics Manufacturing Institute aims to develop manufacturing processes for wide bandgap (WBG) semiconductor-based power electronics that are cost-competitive and significantly more efficient at high powers and temperatures than current silicon-based technologies—leading to more affordable and energy efficient electrical products for businesses and consumers, billions of dollars in energy savings, and high-quality U.S. manufacturing jobs.
The Advanced Composites Manufacturing Innovation Institute will be competitively selected to seek to develop high-speed and efficient manufacturing that lowers the cost and the amount of energy used to produce advanced fiber-reinforced composites for clean energy applications. Advanced composites could help manufacturers deliver clean energy products with better performance and lower costs such as lightweight vehicle fleets with record-breaking fuel economy; lighter and longer wind turbine blades; and high pressure tanks for transportation of natural gas- and hydrogen-fuels.
The Clean Energy Manufacturing Innovation Institutes are coordinated with the Advanced Manufacturing Office's other R&D activities, as well as other EERE Technology Offices. EERE leverages and complements these new Institutes' efforts to develop and transition foundational technologies into the U.S. clean energy marketplace by coordinating and optimizing existing EERE research, development, and demonstration of WBG and advanced composites technology through two focused initiatives crosscutting our Technology Offices: the Next Generation Power Electronics Initiative—across the Vehicles and Advanced Manufacturing Technology Offices—and the Carbon Fiber Composites for Clean Energy Initiative—across the Vehicles, Bioenergy, Fuel Cells, Wind, and Advanced Manufacturing Technology Offices.

Subcommittee. How many will there be in all, and what are the topic areas they will research?

Dr. Danielson. EERE's FY 2015 Budget Request supports the creation of at least one new Clean Energy Manufacturing Innovation Institute, consistent with the President's vision for a larger, multi-agency National Network for Manufacturing Innovation (NNMI), and provides annual and forward-funded support for the two existing Institutes listed above. DOE is planning to invest $70 million into each Institute to be expended over the next 5 years with a forward-weighted funding profile. The FY 2015 Budget request also supports the final installment of DOE's funding contributions for the DOD-led pilot Manufacturing Innovation Institute, the National Additive Manufacturing Innovation Institute (now called America Makes).

Potential topic areas may include scale-up of applied materials genome approaches and nanomaterials for energy; next generation electric machines; process intensification for chemical processes; bio-manufacturing scale-up; smart manufacturing for energy intense processes; and cross-cutting emergent topics in advanced manufacturing for clean energy. These potential topic areas will be developed in consultation and input from stakeholders. Workshops with industry, academia, and other government organizations will be held on each of these topics to determine their suitability for an Institute FOA.

Subcommittee. Are they going to be managed by the Advanced Manufacturing Office through cooperative agreements like Energy Innovation Hubs, which have experienced varying levels of success? What management lessons from the Hub experience are you looking to carry forward?

Dr. Danielson. Institutes will be actively managed by the Department of Energy through cooperative agreements between government, industry, and academia, supported with cost-share funding from Federal and non-Federal sources. These cooperative agreements will have well-defined milestones and will be oriented towards clearly stated research objectives and outcomes. Through our work with the Critical Materials Institute (CMI), an Energy Innovation Hub, we have learned the importance of a strong, hands-on role of active project management through frequent communication between the DOE Technology Managers and the Institute Principle Investigator to provide clear responsibilities and accountability in a cooperative partnership. This includes annual goals and metrics, quarterly milestones and tasks, as well as weekly communications to address any emergent challenges or roadblocks. At the end of the cooperative agreement, the Critical Materials Institute is expected to be financially sustainable from private sector and other funding sources.

Subcommittee. Dr. Danielson, as you're well aware, this subcommittee has been pushing your office to reduce the mortgages of future-year appropriations. You've done an excellent job on this subject since we first raised the issue in fiscal year 2012. However, I'm particularly concerned about the number of unfunded liabilities included within this CEMI proposal.

How are you trying to manage these mortgages? By my calculation, Advanced Manufacturing is looking at $224 million in unfunded liabilities just with the four CEMI Institutes that have been announced thus far.

Dr. Danielson. EERE remains committed to forward funding all projects it supports, including Clean Energy Manufacturing Innovation Institutes, to the greatest extent possible, and looks forward to an open conversation with this Committee in the future on how to maximize the opportunity of clean energy for American families and businesses, while also remaining an active steward of taxpayer resources.
In FY 2014, EERE is currently planning for three Clean Energy Manufacturing Innovation Institutes, including the Next Generation Power Electronics Manufacturing Institute and the Advanced Composites Manufacturing Innovation Institute described above. A Request for Information for potential topics for the third Institute was released in April 2014. The 2015 Budget request for the Advanced Manufacturing Office forward funds at least this third, new Institute and the pay-down of commitments to the other two established Institutes.
EERE does not envision the Clean Energy Manufacturing Innovation Institutes to be open-ended investments. Within 5 to 7 years of its launch, each Institute is expected to be financially sustainable from private sector investments and other sources without further direct funding from the Advanced Manufacturing Office, and the multi-year award funding profiles for the Institutes will reflect this expectation.
EERE continues to minimize the exposure of taxpayers to future mortgages in situations where the funding has yet to be appropriated, and has made significant progress towards this goal to date. By the start of FY 2014, EERE paid down mortgages totaling over $400 million since FY 2012. In FY 2014, we estimate paying down approximately $194 million more in mortgages.
Dr. Danielson, the Critical Materials Institute at Ames Lab was the fifth Energy Innovation Hub launched by the Department, with the aim to develop technologies that make better use of – or eliminate the need for – materials subject to supply disruptions. This initiative was meant to explore ways to produce more rare earths and other critical materials here in the United States, and innovations to wean us off of these materials altogether.

The Hub aims to develop three technologies adopted by U.S. companies: one to diversify and expand production, one to reduce wastes, and one to develop substitutes.

Subcommittee. Dr. Danielson, the Critical Materials Institute at Ames Lab was the fifth Energy Innovation Hub launched by the Department, with the aim to develop technologies that make better use of – or eliminate the need for – materials subject to supply disruptions. This initiative was meant to explore ways to produce more rare earths and other critical materials here in the United States, and innovations to wean us off of these materials altogether.

The Hub aims to develop three technologies adopted by U.S. companies: one to diversify and expand production, one to reduce wastes, and one to develop substitutes.

Can you talk us through how work at the Hub is proceeding? Are they meeting their milestones in developing these technologies, and can you explain to us the type of work they're considering?

Dr. Danielson. The Critical Materials Institute, an Energy Innovation Hub, at Ames National Laboratory started operations in June 2013. The Hub's goal is to reduce or eliminate potential dependences on critical materials (such as rare-earth metals) that are essential to modern and clean energy technologies. A threefold strategy includes the research and development to diversify supply of potential sources, develop alternatives to critical materials in applications and to develop technologies to reduce waste and/or improve recycling from products containing critical materials. The Hub places emphasis on impacting the entire materials lifecycle and on advancing technology to have commercial impact in five to seven year time horizon. The Department requests $25 million in FY 2015 for the fourth year of funding for the Critical Materials Institute to enable the Hub to continue to integrate scientific research, engineering innovation, and manufacturing and process improvements to provide holistic solutions to critical materials challenges facing the Nation.
Since opening for business on June 1, 2013, the Critical Materials Institute has begun work on more than thirty individual projects that promise to enable new technologies that can diversify sources for rare earths and other critical elements, identify substitute materials, and improve the efficiency with which we use existing resources. Specific projects include separation of

rare earth elements from phosphoric acid streams and aluminum nitride phosphors to substitute for rare-earth phosphors in fluorescent lighting, among other areas. Since the Hub started operations, Hub researchers have filed 10 Invention Disclosures and one Patent Application.
Project milestones for the Critical Materials Institute were negotiated between the Hub and EERE's Advanced Manufacturing Office. In addition to quarterly internal reviews, DOE and the Hub evaluate each R&D project annually to ensure that it is meeting its milestones, and its technological impact remains valid. Where a project shows signs of slippage on its milestones, the reasons are identified and addressed. Where the technological driver for a project changes, the individual research project will either be redirected, or in extreme cases cancelled, so its resources can be directed toward more fruitful opportunities within the Hub.

Subcommittee. Critical material is an important topic that several other agencies are also exploring. I believe ARPA-E has funded some work in this field, along with the Office of Science. As the body overseeing the Hub, how is it collaborating with these other DOE programs? Is there any duplicative research?

Dr. Danielson. Research and development investments supported by EERE and the Critical Materials Hub are coordinated among the program offices across the Department. These activities are directly aligned with the aforementioned three pillars of the 2010 and 2011 *Critical Materials Strategy* reports: 1) diversifying the supply of critical materials, 2) developing alternatives to critical materials, and 3) driving the recycling, reuse, and more efficient use of critical materials. Many programs at DOE have a role in the critical materials space, addressing, without duplication, the multiple stages of research and development in a coordinated and effective manner.

For example, DOE has made significant strategic investments to address rare earth permanent magnets for motors and generators. Both EERE (through the Vehicle Technologies Office (VTO) and the Wind Power Technologies Office) and ARPA-E have significant and complimentary efforts to reduce or eliminate potential dependences on critical materials (such as rare-earth metals) that are essential to modern and clean energy technologies through the development of alternative motor and generator topologies which do not require rare earth permanent magnets. For example, ARPA-E's "Rare Earth Alternatives in Critical Technologies" program focuses on early-stage alternative technologies that reduce or eliminate the need for rare earths by developing substitutes in two key areas: electric vehicle motors and wind generators. Technological advances that utilize low-cost and abundant alternatives such as manganese and nickel in these applications are expected to become increasingly vital to our national economic and energy security.

ADVANCED ALUMINUM SMELTING

Subcommittee. Dr. Danielson, several aluminum producers, including at least one U.S. company, are currently pursuing advanced aluminum smelting technology known as inert anode that have broad applications to the Departments of Energy and Defense. This technology holds the promise of using considerably less energy, and greatly reducing emissions intensity. I also understand that foreign state-owned companies are directly underwriting the competition to develop competing technologies.

Are there ways that the Department of Energy, whether through the Advanced Manufacturing Office or through collaboration with the Defense Production Act Committee, can partner with industry on this revolutionary technology to promote national security?

Dr. Danielson. The U.S. Department of Energy (DOE) and the Advanced Manufacturing Office (AMO) have partnered with the aluminum industry since 1996 to develop industry-wide visions and technology roadmaps, including an “Inert Anode Roadmap.” DOE and AMO have since funded many research and development (R&D) projects to advance related technologies, including providing the foundational R&D support to develop inert ceramic anodes. While AMO does not currently have any active cooperative agreement funding solicitations appropriate in aluminum smelting open to industry, this technology is highly innovative and well-aligned with AMO priorities. Additionally, on a merit reviewed basis, firms in the aluminum industry may continue to engage with the program on areas of interest, and on relevant technical assistance requests.

Subcommittee. Are there funds within the budget request to Congress that are ideally suited to help support this cutting-edge development, and/or funds committed to match this technology’s goals of energy and emissions reduction?

Dr. Danielson. EERE does support competitively-selected investments in foundational technologies relevant to energy-intensive industries, widely applicable energy efficiency platform technologies, and clean energy manufacturing across multiple industries.

Subcommittee. If so, where are these funds located and how does the Department intend to distribute these funds?

Dr. Danielson. In FY 2015, the Advanced Manufacturing Office's Next Generation Manufacturing R&D Projects subprogram requests $70 million for three or four new individual competitive funding opportunities of approximately $20 million each in specific innovative manufacturing technology areas. These foundational technology areas will be selected and competed after significant stakeholder input. Examples of candidate topics include cross-cutting microwave and radio frequency process technologies which could reduce heating requirements in numerous energy intensive industries; innovative membranes which could reduce separation energy requirements in industries including desalination, food processing, helium extraction, and chemicals production; and advanced low cost composites. Additional topics to be considered include next generation industrial thermal management technologies including advanced insulation and materials, waste heat recovery, high performance computer simulation of energy intensive manufacturing process, advanced sensors and controls, smart manufacturing (end-to-end integration of IT and knowledge technologies into manufacturing), and other emerging technologies with strong potential for dramatic improvement in energy efficiency and manufacturing competitiveness. Projects will be evaluated for selection through the competitive FOA process.

Subcommittee. Could you please keep us informed on the ongoing activity within DOE on inert anode?

Dr. Danielson. The Department is happy to continue to keep the Committee informed on R&D activities related to inert anode and aluminum smelting technologies moving forward.

BIOENERGY TECHNOLOGIES

DEFENSE PRODUCTION ACT INITIATIVE

Subcommittee. This year's budget request once again includes $60 million to support a Navy initiative to produce hydrocarbon jet and diesel biofuels for military use. This activity was first supported in last year's omnibus appropriations bill for $45 million.

Dr. Danielson, as you're aware, this Committee has expressed concerns in the past about this proposal. In particular, if the technologies are not mature enough, the program would build a bunch of biofuels plants that would go out of business as soon as the military stops buying their above-market product. Can you tell us how the $45 million already appropriated is being spent?

Dr. Danielson. With Congress' support, DOE received the authority in FY14 to support DPA activities to accelerate the development of cost-competitive advanced drop-in hydrocarbon biofuels for the military. By bringing cost-competitive, advanced biofuels to scale, we hope to demonstrate that these projects can eventually produce renewable diesel and jet fuel in the market without government subsidies.
Previously appropriated Navy funds are being used to support four projects through Phase I activities which include front-end engineering design, site selection, and permitting. The $45 million appropriated to DOE will be used for construction, capital equipment purchases, and commissioning of a sub-set of these four projects.

Subcommittee. How will the $60 million included in this year's request be spent?

Dr. Danielson. The projects are currently concluding Phase I and will undergo a merit review in FY 14. A sub-set of the four projects will be selected to proceed to Phase II, with the number of projects selected dependent on the status of funds available. In Phase II, projects will submit proposals for construction, capital equipment purchases, and commissioning, which will be reviewed by technical experts from all three agencies (DOD, USDA, and DOE). The $60 million will be used for Phase II activities, which includes construction, operation, and data collection.

Subcommittee. How much do you expect this total initiative to cost, and ultimately what rewards will these federal investments return for us?

Dr. Danielson. The total DOE commitment for this initiative is $170 million. The DPA biofuel effort is an important element of a comprehensive U.S. Government investment in national energy security. This project, co-sponsored by the Department of Energy, Department of Agriculture, and the Department of Defense, works with the private sector to accelerate the development of cost-competitive advanced drop-in hydrocarbon biofuels for the military. In May 2013 four companies were selected for Phase I of the DPA Advanced Biofuels Production Project. These companies, if successful in both Phases I and II, are expected to deliver up to 170 million gallons of military-compatible fuels per year. The government investment for this effort is expected to be exceeded by the cost share provided by the private sector.

BIOFUELS FROM ALGAE

Subcommittee. Algae seems to alternate from year to year between being a savior of the biofuels world and a technological dead end. This year's request cuts the algae and advanced feedstock program considerably, by $16 million, based on the results of a peer review last May that identified a broad array of technical barriers.

Dr. Danielson, where are we in the development of algae biofuels, and is algae looking more or less promising than a year ago?

Dr. Danielson. Research and investment in algae supports DOE's Bioenergy Technology Office (BETO) mission to catalyze a domestic capability to produce cost-competitive renewable fuels from non-food biomass resources. Algal biomass continues to have the potential to become a high-impact biofuel feedstock. Recent modeling analyses funded by BETO indicate that suitable cultivation sites are available to support the potential for a 5 billion gallons of renewable algal diesel per year production scenario by 2030.[1]

EERE's FY15 funding level request provides continued support for the Algae Program. DOE-funded research, development, and demonstration projects are resulting in breakthroughs along the supply chain to advance the algal biofuels industry towards this production scenario. There are still cost and yield barriers to overcome, but the Algae Program is addressing these with a strategic and structured project portfolio.

Subcommittee. Is the Department re-evaluating its program, and are we likely to see this activity continue in future budgets?

Dr. Danielson. DOE continuously evaluates its programs to maximize research and development opportunities that will have the most impact on our nation's energy future.
Algal biomass production has the potential to: produce a range of biofuels including gasoline, diesel, jet fuel, and ethanol; use waste and salt water;

---

[1] Venteris et al. Siting Algae Cultivation Facilities. http://pubs.acs.org/doi/abs/10.1021/es4045488

recycle carbon dioxide; and provide valuable co-products that can, for example, be used as protein for animal feed.

As such, DOE's Bioenergy Technology Office Algae Program request proposes targeted and strategic investments that have a longer-term impact, and the year-to-year funding request has been consistent to fund core R&D projects.

VEHICLE TECHNOLOGIES

NATURAL GAS VEHICLES

Subcommittee. Dr. Danielson, given the vast supplies of natural gas here in the United States, many people are talking about the possibility of using it for transportation.

Can you discuss the potential for natural gas vehicles, and what are the major obstacles?

Dr. Danielson. Natural gas is a critical component of the Department's "all of the above" energy strategy, as it is a domestically-produced fuel with an extensive distribution system in place. The main challenges to the widespread use of natural gas vehicles are the need for lower-cost, more space-efficient on-board fuel storage; greater availability of vehicle fueling infrastructure; higher-efficiency engines. EERE's FY 15 budget request for Vehicle Technologies includes new efforts on natural gas, specifically to support natural gas storage research and development as well as analysis of vehicle and infrastructure impacts of large-scale adoption of natural gas. It also includes $5 million for a new initiative to support development, testing, and validation activities to integrate natural gas into rail and ship transportation.

Subcommittee. Are we aiming only for trucks and fleets, or could we see natural gas make its ways into consumer vehicles?

Dr. Danielson. Trucks and fleet vehicles are important markets for natural gas vehicles. Natural gas vehicle technology is commercially-available today, primarily in the form of bi-fuel work trucks (pick-up trucks and vans), with only one sedan available for purchase from an original equipment manufacturer. The main challenges to consumer natural gas vehicle use are the need for lower-cost, more space-efficient on-board fuel storage and greater availability of vehicle fueling infrastructure. EERE's FY 15 budget request for Vehicle Technologies includes new efforts on natural gas, specifically to support natural gas storage research and development as well as analysis of vehicle and infrastructure impacts of large-scale adoption of natural gas.

Subcommittee. I understand there is additional funding in this year's budget request to support research into natural gas tanks and fueling. Can you describe that research in more detail and explain how it fits into the Department's long-range plan for natural gas vehicles?

Dr. Danielson. The Vehicle Technologies fiscal year 2015 budget request includes new efforts on natural gas to support the study of the vehicle and infrastructure impacts of large-scale adoption of compressed and liquefied natural gas, and research and development to investigate challenges associated with maximizing the fill capacity of tanks, improving on-board storage, improving the storage and dispensing of natural gas at stations, and improving pressure regulation to enable additional extraction of fuel from tanks. In addition, and building on prior-year activity, funds are requested to begin new, competitively-awarded projects to develop high-efficiency medium- and heavy-duty alternative fuel (e.g., natural gas) engines, improved enabling technologies (e.g., natural gas direct injection technology), and address infrastructure compatibility. The Vehicle Technologies Office will coordinate with and leverage ongoing work across the Department, as well as gaseous storage-related activity in EERE's Fuel Cell Technologies Office.

ELECTRIC VEHICLE "EV EVERYWHERE" AND "ONE MILLION CARS" INITIATIVES

Subcommittee. Dr. Danielson, in March 2012, the President announced an "EV Everywhere" initiative, to be conducted by the Department of Energy's Office of Energy Efficiency and Renewable Energy, Office of Science, and ARPA-E. The program aims to lower the cost of American-made electric vehicles, and is related to the President's goal of having one million electric-drive vehicles on the road by 2015.

How many EV's are on the road today, and how on track do you think we are for reaching the President's goal by 2015?

Dr. Danielson. The goal to be the first country in the world to have one million electric vehicles on the road by 2015 is an ambitious milestone to maintain the growth trend of the plug-in electric vehicle (PEV) market and significantly reduce U.S. dependence on oil for transportation. Growth of plug-in electric vehicle (PEV) sales since market introduction has outpaced historical hybrid electric vehicle (HEV) sales growth by almost 200%, and HEVs are entering the mainstream[2].

- HEV market share in 2013 was 3% of light-duty vehicle (LDV) sales; PEV market share in 2013 was 0.6% of LDV sales.
- PEVs reached nearly 175,000 cumulative sales in December 2013 and are on track to pass the 200,000 sales milestone by spring 2014, about 40 months after the introduction of the production models of the Chevrolet Volt and Nissan Leaf. By comparison, HEVs took 60 months to achieve 200,000 total sales nearly a decade ago.
- The momentum is building as consumers are embracing PEVs in the market.[3]
- Total U.S. PEV sales in model year 2013 nearly doubled those of 2012, approaching 100,000 sold for the year alone.
- Additionally, nearly 10,000 plug-in vehicles were sold in the month of December 2013, up 28% over the sales in December 2012.

[2] "Light Duty Electric Drive Vehicle Monthly Sales Update." Argonne National Laboratory. http://www.transportation.anl.gov/technology_analysis/edrive_vehicle_monthly_sales.html
[3] "Light Duty Electric Drive Vehicle Monthly Sales Update." Argonne National Laboratory. http://www.transportation.anl.gov/technology_analysis/edrive_vehicle_monthly_sales.html

Subcommittee. We hear conflicting reports about the health of the EV market. How healthy is the market, and where is it heading?

Dr. Danielson. The market penetration for plug-in electric vehicles (PEVs) continues to grow. U.S. PEV sales nearly doubled in 2013 compared to the previous year, and consumers are adopting PEVs at a faster pace than hybrid vehicles were when first introduced a decade ago. PEVs reached nearly 175,000 cumulative U.S. sales in December 2013 and are on track to pass the 200,000 sales milestone by spring 2014, about 40 months after the introduction of the production model of the Chevrolet Volt and Nissan Leaf.[4]

We are on the right path, as PEV sales continue to rise. However, it will take millions of vehicles to truly transform our transportation sector and significantly reduce our dependence on petroleum. As such, we need to continue to pursue the research and development needed to further reduce cost and improve performance of PEVs – a key aspect of the *EV Everywhere* Grand Challenge.

Subcommittee. In your office's work on electric vehicles, can you describe for us some of the challenges you face, and some of the achievements you have made thus far?

Dr. Danielson. The Department's Vehicle Technologies Office (VTO) has made key progress across its portfolio to accelerate the development of plug-in electric vehicle technologies.

Battery R&D: Reduced the modeled high-volume production cost of high-energy, high-power batteries from $1000/kWh to $325/kWh (2008-2013). Also, most hybrid electric vehicles sold in the United States today use EERE-developed battery technology.

Electric Drive R&D: Enabled the development of an advanced inverter with an integrated controller that already meets VTO 2015 targets – and is being incorporated by a Tier I automotive supplier in its near-term production plans.

---

[4] "Light Duty Electric Drive Vehicle Monthly Sales Update." Argonne National Laboratory. http://www.transportation.anl.gov/technology_analysis/edrive_vehicle_monthly_sales.html

Lighweight Materials: Supported the design/construction of a composite vehicle floor panel that saves 13 kilograms vs. the original steel design, and the program has enabled the development of a magnesium alloy and processing technique to produce high-strength parts that can absorb crash energy while reducing weight by more than 30%.

Even with these successes, there remain cost and performance challenges to enabling the penetration of advanced vehicle technologies in the marketplace. To address this, DOE intends to use the *EV Everywhere* Grand Challenge technology performance and cost targets to guide EERE investments to reduce the combined battery and electric drive system costs of a PEV by up to 50% from 2013.

Subcommittee. There are a number of other factors that impact the Administration's goal of electric vehicle deployment — events in the private sector, and government policies like vehicle tax credits and gas mileage standards. How will your programs interact with these other federal activities?

Dr. Danielson. The *EV Everywhere Grand Challenge* focuses on the technical innovations – research and development to overcome cost and performance barriers – needed to achieve widespread use of plug-in electric vehicles (PEVs) among mainstream consumers and enable PEVs to compete against conventional vehicle technologies without subsidies. This work complements policies and other activities to bring PEV technologies to market and facilitate early adoption. Successful R&D has enabled auto manufacturers to begin market introduction and will enable them to use vehicle electrification and other advanced fuel-efficient vehicle technologies to comply with government policies such as CAFE standards. Tax credits and other incentives encourage consumer early adoption, but market penetration – and full realization of the petroleum reduction benefits of electric drive – will depend on the technology's ability to compete in terms of cost and performance with incumbent vehicle technologies that dominate the mainstream market today. That is why the research under the *EV Everywhere* Grand Challenge is so important.

The Department coordinates with other Federal agencies, including regular meetings, frequent communication, and both formal and informal interactions with the Environmental Protection Agency, Department of

Transportation, and Department of Defense. In addition, it works closely with U.S. automobile manufacturers through partnerships such as U.S. DRIVE, which provides a framework for frequent and detailed interaction with industry at both the technical and leadership levels. This activity helps to ensure the Department's activities remain focused on the most critical barriers to technology commercialization and avoid duplication of effort.

SOLAR ENERGY

STATUS OF THE SOLAR INDUSTRY AND OVERSEAS MANUFACTURING

Subcommittee. Secretary Danielson, the Administration had high hopes several years ago that we would capture a large portion of global manufacturing in the solar industry. The last few years have painted a different story, which is unfortunate given the level of federal investment in that area.

What does the current global solar manufacturing market look like? How much of it do we manufacture compared to other nations, and how has that changed over the last several years?

Dr. Danielson. Solar PV manufacturing is a growing portion of the worldwide economy accounting for approximately $100B in annual global trade and growing.[5] In 1998, the U.S. held a 38% global market share for the manufacture of PV cells and modules. Over a period of just 15 years, by the end of 2013, that leadership fell to 2%.

With the growth rate in global deployment being 20% to 60% per year over the last several years, the Department believes that the U.S. opportunity in the solar manufacturing sector will grow. Given the size of the global market, it is important that the U.S. compete.

While the U.S. leads the world in innovation and technology in this sector, technology leadership has not translated into manufacturing leadership. However, the U.S. has competitive strengths in the solar manufacturing value chain which includes materials and equipment used to make solar cells and modules. In 2012, the value of U.S. manufacturing of photovoltaic (PV) products exceeded $2.3B. We are seeing that, despite the significant investment by other countries to dominate in solar manufacturing, the U.S. continues to produce significant value added manufacturing and can be competitive globally. With a strong innovation ecosystem supported in part by the DOE alongside policy leadership at the state and federal level, it is possible to create resurgence in U.S. solar manufacturing.

[5] According to one manufacturing industry trade association estimate.

Subcommittee. What led manufacturing to shift overseas so dramatically?

Dr. Danielson. Countries abroad have provided low cost or zero cost capital to support and finance manufacturing expansion within their own domestic markets. For instance, China built very large factories which created vast economies of scale and overcapacity that has resulted in prices that drastically undercut Western manufacturing costs. As a result of some of these policies, U.S. manufacturing market share has decreased.

The Department's FY 2015 Request supports reversing the trend of offshoring of PV and CSP component manufacturing and assembly and strengthening the manufacturing competitiveness of the U.S. solar supply chain. The request supports technology and process development and demonstration that can enable American companies to manufacture and deploy solar technologies competitively. These activities aim to develop commercially and technically viable manufacturing technologies that can achieve a significant market or manufacturing impact over the short term (one to four years). EERE also supports the initial validation and ramp-up to pilot-scale manufacturing of innovative new manufacturing processes and tools.

Subcommittee. What do you foresee happening in the next several years or decades?

Dr. Danielson. The Department sees tremendous opportunities for solar energy in the years ahead. In 2013, approximately 4.75 GW of PV capacity was installed in the U.S. This is almost 11 times greater than the annual installations in 2009 (435MW). More and more Americans are choosing solar energy to power their homes and businesses leading to record job growth in the solar installation sector.
With demand for solar at a record high in the U.S. and globally, and solar job growth in the U.S., there is opportunity for U.S. businesses to capture a greater portion of the global solar value chain. DOE efforts to reduce solar technology costs, including soft costs, will support this value chain.

It is possible for U.S.-based companies to regain leading positions in this very turbulent industry; but the challenge is greater when U.S. manufacturers are competing against companies that have received significant support from foreign governments. In the near term, where countries like China have invested heavily in their domestic manufacturing industry, it is unlikely that U.S. manufacturers can compete directly on cost alone. Differentiation will be required and quality and performance are areas where U.S. manufacturers are able to establish competitive advantages.

In the long term, innovation can help the U.S. regain manufacturing. Detailed cost analysis by the National Renewable Energy Lab and Massachusetts Institute of Technology found that the advantages of scale and government support in China are significant but can be overcome with innovation.[6] If we can manufacture higher performing products in advanced automated factories, we can close the gap with lesser technologies. For example, U.S. manufacturers' long history and expertise in advanced materials give advantages in producing higher quality and more durable materials that are supplied to an industry where products are expected to last upwards of 25 years in the field.

There are several broader competitive advantages that could benefit the U.S. solar industry. For example, as technology costs come down, overseas shipping costs become a significant fraction of the cost of the finished goods and therefore regional manufacturing will have advantages. Additionally, low-cost and reliable electricity in parts of the United States enables best in class solar manufacturing. This boosts the competitive advantage of parts of the U.S. manufacturing supply chain, such as polysilicon and advanced materials producers.

Subcommittee. This year's budget request includes $282 million the Solar Energy research and development program. That is a large sum, given that most solar manufacturing has shifted overseas in the last several years. How can we make sure that funding goes towards bringing manufacturing back here, instead of just improving products that are manufactured overseas?

Dr. Danielson. Recognizing that there is tremendous value of manufacturing for the U.S. innovation ecosystem and economy, and that value is lost if companies simply manufacture products overseas after developing the technology in the U.S., the DOE Solar Energy Technologies Office (SETO) has asked applicants for R&D funding to include *U.S.*

---

[6] NREL, MIT, "Assessing the Drivers of Regional Trends in Solar Photovoltaic Manufacturing," *Energy Environ. Sci.*, 2013, 6, 2811-2821: http://pubs.rsc.org/en/content/articlehtml/2013/ee/c3ee40701b

Manufacturing Plans as part of the application. The applicant-proposed manufacturing plans will be considered as part of the evaluation of the proposal and eventually negotiated into a commitment as part of an award. This inclusion of U.S. manufacturing plans in SETO's award funding process is an important step in ensuring the federally supported R&D does not shift overseas for manufacturing.

The Department's FY 2015 Request supports reversing the trend of offshoring of PV and CSP component manufacturing and assembly and strengthening the manufacturing competitiveness of the solar supply chain. EERE supports technology and process development and demonstration that can enable American companies to manufacture and deploy solar technologies competitively. The Department has recognized that the U.S. will not compete across the entire solar value chain; however, the U.S. still has competitive strengths, as described above.

It is possible for U.S. based companies to regain leading positions in this very turbulent industry. Differentiation will be required and quality and performance are areas where U.S. manufacturers are able to establish competitive advantages. For example, there are American manufacturers that have some of the highest performing silicon modules on the market and are able to price at a premium to lower performing commoditized silicon modules.

Subcommittee. Is there a next generation technology on the horizon that might enable the US to excel in solar manufacturing once more?

Dr. Danielson. The Department has a track record of supporting innovative solar technologies to the point that they are cost competitive and can be commercialized by U.S. businesses. For example, EERE and the National Renewable Energy Laboratory supported R&D and optimization of a thin-film CdTe solar photovoltaics technology that led to the emergence of a leading worldwide PV manufacturer. Upcoming competitive solicitations, such as SunShot Incubator round 10, will support early-stage assistance to help small business commercialize innovative solar technologies. The Department has seen success in supporting early innovations through these programs. For example, a former SunShot Incubator awardee is now building a factory in Buffalo, NY, with New York State investing $225M into facilities. By supporting the development of "off-roadmap" technologies through these efforts, the Department fosters the latest in solar innovation.

At the same time the Department is investing in the next generation of solar technologies, the FY 2015 Budget places emphasis on driving down the costs of solar and increasing U.S. competitiveness by improving many existing solar technologies and manufacturing processes. The Department has a focused portfolio of high impact R&D that spans several different solar technologies ranging from wafer based silicon, to thin silicon, to thin films. All of these approaches have the potential to enable the U.S. to regain value in the solar supply chain.

PROGRAMS FOCUSING ON SOLAR "SOFT COSTS"

Subcommittee. At the Department's discretion, the Solar Energy program directed an additional $13 million from last year's omnibus appropriations bill into research and other activities to lower the "soft costs" of solar energy, which include local permitting and other non-technical activities. This year's budget request proposes to increase those activities by another $3 million.

Dr. Danielson, can you explain how EERE is attempting to reduce "soft costs." Do these funds simply provide grants to cities to build websites to speed up their permitting processes? And of the various soft costs, what does DOE really have the ability to reduce?

Dr. Danielson. As technology advances lead to lower solar module costs, soft costs now make up over half of the cost in commercial systems and an average of 64% of the total cost of installing residential solar. Soft costs include design and installation labor, labor invested in executing permitting and interconnection as well as permitting, interconnection and inspection fees, customer acquisition costs, financing and contracting, operations and maintenance, transaction costs, sales tax, supply chain costs, installer/developer profit, and indirect corporate costs.

DOE plays an important collaborative, information-sharing role that makes utilizing solar less costly for the average American. EERE supports replicating soft cost successes and best practices from different cities and states where solar markets are more mature to burgeoning and growing markets as well as establishing uniform contracting and business best practices for professionals. This can be done by establishing data standards, developing reference analyses and guidebooks, training people, building networks for peer-to-peer learning and supporting businesses that are building automation tools and software that helps to streamline processes like site assessment and real estate valuation. The training, data and tools developed through SunShot awards support the work of a wide range of professionals who establish public safety codes and regulations. EERE also addresses other barriers to solar deployment and is implementing a Grid Integration Initiative that focuses on enabling the integration of energy efficiency and renewable energy technologies into the Nation's energy system at a significant scale in a safe, reliable, and cost-effective manner by conducting high impact research, development, and demonstration (RD&D) on next-generation EERE technologies and solutions.

Subcommittee. Is this a good use of federal funds—and is it something that can be leveraged to beyond just the handful of cities that would win the grants?

Dr. Danielson. Investment in soft cost initiatives is an appropriate role for EERE as it strives to reach the SunShot goal of making solar technologies cost competitive without subsidies by 2020. The Department estimates that non-hardware soft costs now make up an average of 64% of the total cost of installing residential solar. Programs like the Rooftop Solar Challenge are specifically designed to create replicable, regional solutions and to avoid targeting just a handful of cities. Creating standards, developing replicable solutions and using a regional approach have been shown to create significant cost reductions, because they reduce market fragmentation. U.S. soft costs are almost four times greater than those in German markets, but are steadily improving with the establishment of these standardized approaches that can be scaled.

WIND ENERGY

OFFSHORE WIND DEMONSTRATION PROJECTS

Subcommittee. Dr. Danielson, your Wind Energy program has been very excited about an offshore wind demonstration project for several years, and this year you're set to announce the selected applicants who are entering the second round of the program.

Can you give us a summary of where you are in the project? I understand it's a phased approach, and we're about to enter Phase 2?

Dr. Danielson. Phase 1 is complete and we are evaluating the seven projects and down-selecting to three projects for Phase 2. Each of the Phase 1 teams received $4 million from DOE in 2012 to complete the engineering, design, site evaluation, and planning phase of their offshore wind demonstration projects. The review will evaluate technology development and economic feasibility as well as the project's ability to lower the overall cost of energy from wind power. The projects are also being reviewed to assess progress made in the permitting process as well as progress made towards securing a power off-take agreement. Through this review process, the Department will select up to three projects for continued four-year follow-on funding, contingent on appropriations and the availability of future year budget authority, that will support follow-on design, fabrication, construction, and deployment to achieve commercial operation by the end of 2017. We expect to announce the second phase awards before June 2014.

Subcommittee. How many projects were initially selected, and how many will you ultimately build to completion?

Dr. Danielson. The Department of Energy announced funding in 2012 for seven advanced technology demonstration projects. The Department intends to select up to three projects for continued four-year follow-on funding, contingent on appropriations and the availability of future year budget authority, that will support follow-on design, fabrication, construction, and deployment to achieve commercial operation by the end of 2017.

Subcommittee. Can you explain how this demonstration project fits into the marketplace? How are these projects different than what the private sector is already supporting, and what offshore wind projects are moving forward without federal support?

Dr. Danielson. Current offshore wind technology is not cost-competitive in the U.S. without subsidies. In some installations around the world, current technologies can be cost competitive in regions of high electricity prices. The Department estimates the energy cost of current technology for offshore wind technology is approximately $0.20/kWh. The DOE projects are demonstrating advanced, first-of-a-kind technologies that have the potential to be cost-competitive without subsidies. For example, different floating platform designs are being pursued for deepwater applications that avoid the costs of traditional long monopole configurations.

Subcommittee. Can you describe the technological landscape of offshore wind projects in other countries? Who is excelling in this field, and how does the U.S. stack up?

Dr. Danielson. Europe is ahead of the U.S. in commercial deployment of offshore wind, and both Europe and Japan have advanced offshore wind demonstration programs that are similar to DOE's program.

Europe, with higher electricity prices than the U.S. and shallower water, currently has the most offshore wind deployed, and is the leader in the offshore wind industry. Europe deployed over 1 GW of offshore wind capacity in 2013, bringing their total deployed capacity to approximately 6.5 GW. All of the offshore wind installations in Europe have been bottom fixed, with the exception of the Statoil Hywind and Principle Power WindFloat deployed off of Norway and Portugal, respectively. Additionally, Europe is excelling in the design of advanced large offshore wind turbines, pushing turbines into the 6-MW and beyond range.

Japan has deployed several demonstration scale offshore wind projects, ranging from one to eight turbines. Japan is also developing commercial floating offshore wind platforms. In late 2013, Japan deployed its first floating offshore wind platform—a 2-MW semi-submersible—as well as a first-of-kind floating substation. Two additional floating platforms—another semi-submersible and an advanced spar—supporting 7-MW turbines are expected to be deployed at the Fukushima site in 2015.

With the support of the Department, the United States will demonstrate up to three offshore wind projects, which will be operational by 2017. Through these demonstrations, the United States stands to compete in the international offshore wind industry. There are several key differences between the research, development, and demonstration challenges facing U.S. offshore wind deployment and international activity in this industry; the U.S. offshore wind industry must address more diverse weather conditions, including hurricanes, and greater water depths than found in other regions and climates. The United States is one of the leaders in advanced foundation designs for both bottom-fixed and floating foundations, with a number of innovations coming from U.S. companies. Seabed characteristics are also different in the United States, requiring different technological solutions for fixed-bottom systems. Current monopile technology that is regularly deployed in Europe may not be economical in the United States due to the combination of larger turbines and weak U.S. soil conditions offshore. Thus, supporting offshore wind technology demonstrations in different regions across the United States is one goal of the Department's offshore demonstration strategy, and one distinguishing factor from the majority of research performed by other countries to make offshore wind commercially viable.

WATER POWER

DOUBLING CONVENTIONAL HYDROPOWER – HYDRONEXT

Subcommittee. Dr. Danielson, the Department's fiscal year 2015 budget request contains a new initiative within the Water Power program called "HydroNEXT." From what I understand, this is a 5-year, $100 million proposal to double hydropower generation in the U.S. by 2030 and will focus on new turbine development, modular technologies at small, unpowered dams, and stream reach development using pipe diversion. For years, we've read federal studies about the vast inland water energy resources the nation has—gigawatts of untapped renewable power.

What is the total potential for additional electricity production if we were to use all of our inland water resources?

Dr. Danielson. Recent resource assessments[7] have projected between four and 10 gigawatts (GW) of potential additional hydropower output at existing hydropower facility powerhouses; between 66 and 85 GW from new stream reach development, including new sites and constructed waterways; about 12 GW from non-powered dams; and 49 GW (in preliminary permits) for pumped storage hydropower. Realization of these potential resources could approximately double the current hydropower production capacity of 78 GW and the storage capacity of 22 GW. In electricity production terms, tapping these new hydropower resources could provide an additional 10% of U.S. electricity use on top of the 7% that hydropower provides today.

Subcommittee. We have also heard the criticisms of proposals such as these – (1) that the major constraints to making current hydroelectric facilities are capital costs; (2) that modular reactors at small dams require too much up-front investment and lengthy permit approvals; and (3) that diverting water for electricity generation, particularly out West, just isn't practical.

---

[7] Existing hydropower potential resource projected utilizing DOE National Hydropower Asset Assessment Program (NHAAP) Existing Hydropower Assets database: http://nhaap.ornl.gov/content/existing-hydropower-assets; new stream reach development potential resource and non-powered dam potential resource estimates from National Research Council, *An Evaluation of the U.S. Department of Energy's Marine and Hydrokinetic Resource Assessments*, Washington, DC: The National Academies Press, 2013.; and pumped storage preliminary permit information from reporting by FERC: http://www.ferc.gov/industries/hydropower/gen-info/licensing/pump-storage.asp.

Can you speak to those criticisms and explain to us why you think it wise to increase our investment in this field, as your budget proposes?

Dr. Danielson. The Department acknowledges that there are major barriers to the development and deployment of large-scale hydropower, such as high capital costs, lengthy permitting time, and environmental concerns. These challenges are the focus of the new HydroNEXT initiative. The Department's HydroNEXT initiative will focus on development and demonstration of low-impact technologies to capture new stream reach resources. Compared to large conventional hydropower, development of these new stream reach resources will result in lower environmental impact and reduced capital costs through research in modular "drop in" systems that are much smaller (1-50 MW) than typical impoundment dams. These modular turbines are projected to minimize civil works and permitting time and maximize ease of manufacture and installation.

The development of smaller, lower impact technologies will spur industry innovation and create opportunities for new sustainable hydropower development, while taking advantage of recent legislation that streamlines the Federal regulatory process for many types of hydropower development. The initiative also supports RD&D that addresses the significant opportunity to cost-effectively improve technical and environmental performance and flexibility, and increase generation of existing non-Federal hydropower assets, requiring no new impoundment dams.

The Department also recognizes the competitive uses of water and the adoption of new hydropower technologies will differ by region. New hydropower development opportunities are assessed by the Department using long-term averages for water availability, similar to how hydropower developers evaluate the feasibility of sites. Areas with low water availability or frequent droughts are not attributed with high energy potentials. While many parts of the western U.S. --like those affected by frequent droughts-- have relatively few opportunities for new hydropower, preliminary results of EERE analysis of new hydropower development opportunities show there are still many areas in the western U.S. with sufficient water availability for new hydropower developments to be considered. To minimize impact on water resource availability, HydroNEXT R&D focuses on diverting water instead of new large impoundment dams.

Subcommittee. Can you give an example of low-cost improvements?

Dr. Danielson. There is significant opportunity to cost-effectively improve technical and environmental performance and flexibility, and sustainably increase generation at existing hydropower facilities (50% of which are more than 50 years old). For example, previous DOE investments in R&D relevant to existing hydropower have led to significant improvements in generation–between 12% and 37%– primarily as a result of improved operations and forecasting

R&D activities that will aid in the deployment of low-cost operational improvements and the implementation of improved modeling tools are ways that EERE can support increased efficiency and environmental performance at existing facilities. For example, EERE is working with its Federal partners including the Bureau of Reclamation, Army Corps of Engineers, Fish and Wildlife Service, and other resource agencies to improve operational modeling tools to characterize water quality, and is working with manufacturers to utilize biological design criteria in the design of their future generating units. EERE will also invest in activities focused on improving the computational simulation of water-quality issues and associated measurement infrastructure to enhance hydropower systems optimization and operation—increasing energy generation, system flexibility, and environmental benefits. These low-cost improvements, when adopted, can dramatically increase the generation and the environmental performance of new and existing hydropower facilitates.

REDUCTION TO MARINE AND HYDROKINETIC WATER PROGRAMS

Subcommittee. Dr. Danielson, proponents of Marine and hydrokinetic energy point to the fact that as much as 10 percent of the nation's energy could be generated from the motion of ocean water just off our coasts. Essentially, it's an untapped natural resource. And yet, the budget request for the program that advances ocean energy and hydrokinetic technologies is consistent in the tens of millions—an order of magnitude lower than many of your other programs. We hear about other countries moving forward developing ocean-based energy technologies, and it looks like the Administration has ceded this market to others.

This year's budget request proposes to decrease this program by $11 million. Are we under-investing in this area in proportion to the other programs in your office?

Dr. Danielson. EERE is taking MHK research, development and demonstration seriously, and believes it has an important role in the Administration's "all of the above" energy strategy moving forward. Given the relatively low technical maturity of devices and the nascent state of the industry, significant technological research and development is necessary to drive MHK down the cost curve towards competitiveness with localized electricity markets. As DOE currently estimates the cost of MHK to be $.60/kWh, the technology is more than 4 times more expensive than where it needs to be to be competitive in these markets. This makes MHK energy a longer-term technology.
In FY 2015, the President's Budget Request reflects a more equitable split across MHK and hydropower. The $30.5 million requested in FY 2015 for MHK allows the Water Power Program to continue its ongoing efforts to advance water power technologies and accelerate their market adoption. For example, the FY 2015 Request supports continued MHK applied research and development and testing of innovative component technologies designed specifically for the challenges of the marine environment, and testing and research to address key environmental uncertainties that arise within the rapidly developing industry, among other activities. In summary, the President's Budget Request provides the priority and funding stability necessary to continue making progress in marine and hydrokinetic technologies.

GEOTHERMAL

GEOTHERMAL FIELD SITES – "FORGE"

Subcommittee. For two years, this Committee has considered the Department's proposal for an Enhanced Geothermal Field Sites, a 6-year, $160 million project to serve as a dedicated test site for validating new geothermal technologies. Last year's omnibus appropriations bill included $2 million for site preparation and characterization but held off approving the proposal in full.

Dr. Danielson, can you discuss the research value in having a dedicated test site? What exactly are these field sites meant to accomplish that regular demonstration and test projects cannot?

Dr. Danielson. The Frontier Observatory for Research in Geothermal Energy (FORGE) is a dedicated subsurface laboratory where novel technologies and techniques can be tested, with a central focus on EGS optimization and validation. This first-of-its-kind effort is intended to promote transformative and high-risk/high-reward science and engineering focused on addressing critical barriers of Enhanced Geothermal Systems. In addition, the new initiative is expected to include a robust instrumentation, data collection, and data dissemination effort to capture and share in real-time a higher-fidelity picture of EGS creation and evolution processes—more so than any prior geothermal demonstration in the world. FORGE is expected to also provide a collaborative and inclusive platform for advancement of EGS via participation from geothermal and other subsurface stakeholders. This single site, where industry, academia and national labs can collaborate, is intended to provide a more cost effective way to carry out the research, compared to many singular grants where each individual demonstration site must be characterized, instrumented, modeled and validated. Finally, FORGE will allow for the highly-integrated comparison of technologies and tools in a controlled and well-characterized environment.

FORGE will bridge lessons learned from our existing EGS field demonstrations and R&D portfolios. In doing so, it will allow optimization and validation of EGS technologies in a DOE-managed field setting, but with broad collaboration among academia, industry, and DOE National Labs to accelerate the development and deployment of EGS. While we have achieved technical successes in our current demonstration portfolio, FORGE will encompass multiple years of development and testing of high-risk science and engineering, which aims to reduce risk for the private sector industry. The geothermal sector is not financially equipped to invest in technology R&D due to their small size, which limits the amount and nature of the R&D testing performed at the current EGS demonstrations. Although these demonstrations are essential to inform the future direction of EGS, another key distinction between existing private-sector led demonstration projects and FORGE is the ability to develop, test, and comprehensively monitor an engineered reservoir at a larger scale that has not yet been demonstrated, using new technologies in pre-commercial stages of development.

Subcommittee. How are you planning to spend the funds provided in fiscal year 2014, and can you describe for us what this year's budget request would accomplish for the project?

Dr. Danielson. After nearly two years of scoping, the Geothermal Technologies Office (GTO) released a Notice of Intent on January 21, 2014, announcing the upcoming FORGE FOA. GTO has allocated $10 million of FY14 appropriations to the FORGE initiative. The Office will utilize $2 million in FY14 for Phase 1 activities to award up to 10 sites as part of the initial site characterization and selection phase. During this Phase, all existing site data will be aggregated and incorporated into and initial geologic and subsurface model, including its suitability as an EGS site. EERE plans to carry over $8 million into FY 15 for Phase 2. Phase 2 activities will begin after the competitive downselect from the initial 10 teams is completed, and will be funded by the remaining FY14 carryover ($8M) and FY15 appropriations. Phase 2 will include activities to initiate National Environmental Policy Act (NEPA) compliance, detailed geologic and geophysical site characterization and establishment of a long-term monitoring infrastructure with associated data sharing, implementation of relevant plans as developed in Phase 1, and initial planning for R&D technology testing and evaluation in Phase 3.
In FY 15, GTO is prepared to advance FORGE through a variety of efforts beyond initial site characterization with Congressional support:

- Complete down-select from up to 10 Phase 1 teams, to up to three potential FORGE teams/sites and complete cooperative agreement negotiations with this next phase for further site characterization;

- Compile site data into a conceptual geologic model of each of the proposed sites and make conceptual models available to the public through the Geothermal Technologies Program Geothermal Data Repository;
- Develop operational plans for each of the proposed sites (e.g. Data Dissemination and Intellectual Property Plan, Communication and Outreach Plan, Research and Development Implementation Plan)

These activities will subsequently inform the competitive, merit-based selection of a single FORGE site and site operations team.

Subcommittee. As I'm sure you're aware, this is an exceptionally large project for the geothermal program. Can you discuss where your current mortgage levels are within the geothermal program, and how this project would impact your mortgage levels of future-year appropriations?

Dr. Danielson. The Geothermal Technologies Office has been diligently paying off mortgages as directed; our current mortgage level is approximately \$10.5 million. By the end of FY15, the Office will have zero mortgages. Once the \$31 million FORGE FOA is issued for site selection and characterization, FORGE would constitute the GTO's only mortgage amounting to \$21 million and would be paid off entirely in FY15.

The work done under the first and second phases (totaling \$31M) will get the site prepared and characterized for the third phase focused on implementation. The approach for this third phase is to invest additional funds over 4-5 years with the research funding commitments made only one fiscal year at a time based on the appropriations level each year. Thus, each year, solicitations for competitive research at the site will be adjusted based on the annual appropriations, thereby, not "mortgaging" outyear funding commitments ahead of the appropriations process.

Subcommittee. If this project has such potential, how would you reprioritize other programs within EERE?

Dr. Danielson. The Department is committed to meeting the President's "all of the above" energy priorities, and in FY15 is focusing efforts across our Program Offices on subsurface engineering activities to support DOE's missions. We support the priorities expressed in the President's budget, and are optimistic about the high-impact opportunities in EGS and FORGE.

GTO's EGS Program would dedicate the majority of its budget to funding FORGE, with the exception of a base funding level necessary to support existing high-impact, early-stage development R&D, with the intent of completing technology prototyping by FY16 and subsequent field testing at FORGE. Once the site selection and characterization phases of FORGE have been completed, R&D and associated operations at the site will be funded through annual appropriations within EGS.

Subcommittee. We've seen studies and assessments showing that geothermal resources across the country, if tapped by enhanced geothermal systems, could produce massive renewable quantities of energy for our nation.

What is the potential for enhanced geothermal systems, and how close are we to realizing it?

Dr. Danielson. Techniques developed under our enhanced geothermal systems program are having both a near term impact in expanding today's geothermal fields and a longer term impact in proving the potential feasibility of geothermal making a significant contribution to our future electricity mix with base-load, carbon-free renewable energy.

According to NREL analysis, in-field and near-field EGS projects—EGS projects located in or near an existing hydrothermal field—have the potential to add 7-10 GWe in the U.S. alone, at highly competitive rates and at low risk. If this resource potential is realized, it would increase current installed capacity by 2-3 times. GTO's current portfolio consists of numerous EGS R&D projects and five private-sector run EGS demonstration projects, four of which are situated in near- or in-field environments. Two of these demonstration projects have successfully created EGS and now are generating cost-competitive power from these successful developments by taking advantage of existing infrastructure.

The deep EGS resource is estimated by USGS and NREL to be on the order of 100+ GWe, and can be accessed at depth across the United States, rather than focused only in the western states. GTO considers FORGE to be the critical next step towards creating a commercial pathway for EGS as it will create the tools and methodologies necessary to access and develop this vast renewable resource. FORGE will yield a subsurface "roadmap" of how to create large-scale, sustainable, and reproducible heat exchange systems; successfully test and refine new methods and tools in a controlled environment; and capture high-fidelity data for distribution to both public and private sector stakeholders. The result will be a commercial pathway to large-scale EGS power generation, beyond the EGS demonstration projects funded by DOE.

Subcommittee. Can you discuss how the revolution of horizontal well technology has opened new possibilities within the geothermal program?

Dr. Danielson. The technology to drill horizontal wells with long lateral legs has revolutionized the oil and gas industry by allowing a single well to access a much larger volume of a horizontal layer of shale (reservoir rocks) than was previously possible with a vertical well. Similarly, horizontal well technology—or more generally, the ability to drill and complete wells in any non-vertical geometry— has the potential to greatly improve the productivity and economics of geothermal wells. Specifically, horizontal well technology opens new possibilities for engineering geothermal reservoirs because the productivity of a geothermal well is dependent in large part on its ability to intersect a large number of fractures. Allowing a single well to access a greater volume of hot, fractured reservoir improves its ability to act as a conduit for the fluids that are circulated through geothermal wells and ultimately used to generate power. Because of the harder rocks (e.g., igneous/metamorphic formations as opposed to sedimentary) and hotter environments than encountered in oil and gas settings, new technologies and practices are necessary to integrate horizontal wells into geothermal energy production.

GTO is supporting efforts to bring horizontal drilling and completions to the geothermal industry, including funding to support a 300°C direction drilling system under development at Baker Hughes, costing analysis performed by Sandia National Laboratories, and a new collaborative effort initiated in FY14 between NREL and the Colorado School of Mines to conduct R&D in a number of areas including oil and gas tech transfer and horizontal drilling.

ELECTRICITY DELIVERY AND ENERGY RELIABILITY

CYBER SECURITY

Subcommittee. Ms. Hoffmann, the energy sector's critical infrastructure has been subjected to a dramatic increase in focused cyber attacks in recent years. Your office has the responsibility of protecting the electricity grid and other energy infrastructure against the ever-present threats of a cyber attack.

Can you talk us through the state of the energy's sector's cyber security? What are our existing capabilities, who are the bad actors, and how do energy control systems differ from normal IT systems in the event of a cyber incident?

Is our energy infrastructure currently capable of surviving a major cyber incident while sustaining critical functions?

How can this Committee be helpful in providing you the resources you need to develop and implement new technologies to keep our energy infrastructure secure?

Ms. Hoffmann. There are many privacy, protection, security, and legal constraints to collecting and maintaining data from the sector which make it very difficult to quantify the state of cybersecurity. Based upon OE's outreach with the energy sector, the state of cybersecurity can best be described as improving. OE itself does not secure or protect the energy sector. This is the responsibility of the more than 6000 companies that deliver all forms of energy. OE builds industry capacity by developing tools and technology and collaborating with Federal agencies and industry to improve existing cybersecurity capabilities to defend against all bad actors.

Critical infrastructure owners and operators in the energy sector need to protect both their information technology systems and their energy control systems. There are significant differences between the two types of systems. Unlike IT systems, energy control systems are required to be operational at all times to maintain the energy balance between energy sources and energy users. Energy control systems also need to respond within milliseconds to place the energy delivery system in a safe state should an event occur that would damage the system.

The energy industry in the United States has a good record of maintaining operations and recovering from incidents that interrupt the delivery of services. Utilities and oil and natural gas companies are able to switch to manual operations in order to maintain critical functions for periods of time. As the cyber threat grows in frequency and sophistication, DOE, in its leadership role as the Sector-Specific Agency for the energy sector, is working with Federal partners and industry to strengthen the energy sector's ability to respond to and recover from a major cyber incident. This includes development of robust information sharing and situational awareness tools, a cyber incident playbook, a 5-year roadmap of industry required capabilities, and regular exercises to test incident response capabilities. It also pursues a robust research and development program that develops cutting-edge cybersecurity solutions for the energy sector that are uniquely designed to address energy delivery systems.

Cybersecurity continues to be a priority for the Department, and the FY 2015 budget request of $42 million for the Cybersecurity for Energy Delivery Systems program reflects the importance and urgency of our efforts in this critical area.

GRID MODERNIZATION

Subcommittee. Ms. Hoffmann, we discussed both emergency response and security. Grid modernization is another important aspect of grid operations.

Can you discuss the distribution system and the challenges that part of the grid is facing? What are the priorities and activities in your budget request that will strengthen the grid on the distribution side?

Ms. Hoffmann. The electric distribution system - the part of grid that supplies power to the end-user (residential, commercial and industry) - is a critical component of the nation's energy infrastructure that provides the foundation for America's economic success. Today it faces many challenges as it is being used in ways that it was not originally designed for, and is in need of a major overhaul.

The electricity industry is in the midst of a major transformation, and the distribution system must adapt to the needs of a vibrant, technologically advancing, national economy by addressing the following challenges: 1) increased grid complexity due in part to an increasing penetration of distributed resources which require greater visibility and tighter control to maintain stability and optimize operations; 2) greater demand variability caused by ongoing changes in the character of electricity demand (e.g., increasing air conditioning use, decreasing industrial electricity use, growth of electric vehicles) having an adverse effect on capacity utilization; 3) increasing customer demands for more choice and control over electricity services to meet their individual end-use needs for power quality and reliability requiring a transition from the current commodity delivery model to one focused on services; 4) increasing damages from extreme weather events that require a more resilient distribution system; 5) flat to declining demand as customers depart the system in favor of their own generation sources creating financial stress on utilities required to maintain and upgrade the system; 6) changing environmental and economic forces driving different generation sources; and 7) interoperability challenges between new and legacy equipment.

The Smart Grid program focuses on modernization of the distribution system. The 2015 request for this program emphasizes investments in two key areas.

Microgrids are localized grids that can disconnect from the traditional grid to operate autonomously and help mitigate grid disturbances to strengthen grid resilience. The request for **microgrid research** seeks to develop new technologies and concepts for the design, operation, and control of local generation sources and local loads to provide differentiated services (such as higher reliability for critical loads such as hospitals and transportation centers), as well as to support the creation of more resilient communities. Key activities include supporting industry-led projects on microgrid design and testing, national lab research and development on microgrids as a grid resilience resource for faster restoration and recovery during outages; launching a direct current microgrid effort toward achieving climate-neutral buildings, and expanding state partnerships on microgrid design and development beyond the two current projects in NJ (i.e., rebuilding electric infrastructure in Hoboken, NJ, and enhancing grid-rail resiliency through the NJ Transit Grid project).

Smart Grid 2.0 seeks to develop innovative concepts in the design, control, and optimization of highly distributed grid systems. Building on past investments, the effort will focus on the development of advanced distribution management systems (ADMS) as well as transactive control methodologies that have been successfully demonstrated in two pilot projects – PNNL Olympic Peninsula project in Washington State and the AEP gridSmart demonstration in Ohio. The goal of the ADMS is to accommodate the rapid and complex communication/interactions between distribution and transmission that will be needed as the balancing at the distribution level becomes more complex due to the integration of large quantities of distributed energy resources, electric vehicles charging, and demand side management technologies. Transactive control will build off of the lessons learned in the two projects cited above and develop decentralized and coordinated control schemes and market incentives to enable consumers to seamlessly interact with the electricity system to achieve stable control and reliable energy delivery at greater efficiency. Key activities will support adaptation of models and tools to simulate the impacts of transactive control, development of economic-engineering hybrid controls, and assessment of the value of energy and services.

NUCLEAR ENERGY

STRATEGY AND PROGRAM MANAGEMENT

THE MARKET FOR NUCLEAR ENERGY: THE CASE OF VOGTLE

Subcommittee. Secretary Moniz announced last month the Department's approval of $6.5 billion in loan guarantees for two new nuclear reactors under construction in Georgia by a consortium led by Southern Co. The expansion at Vogtle signifies the first nuclear power plant to be built from scratch in more than three decades.

Dr. Lyons, can you provide us an update on how construction is proceeding?

Since it's the first new plant in a long time, are we learning anything yet from the experience?

Dr. Lyons. The construction of the two new nuclear units at Vogtle is going very well with significant progress and milestones being achieved. Vogtle Units 3 and 4 are progressing in accordance with an integrated schedule and are expected to be placed into service in 2017 and 2018, respectively.

Since receiving the first Combined Construction and Operating License (COL) in February 2012, significant construction progress has been made on both Vogtle Units 3 and 4. First and foremost, the project remains focused on meeting and exceeding nuclear quality standards. The Contractors, Westinghouse and Chicago Bridge & Iron (CBI), along with Georgia Power Company provide continuous oversight of all safety-related aspects of the project. In addition, the Nuclear Regulatory Commission (NRC) has conducted site construction inspections, audits, and vendor procurement inspection visits to oversee and ensure the construction is in accordance with the design. Quarterly visits to the site by the Department's Loan Programs Office (LPO) along with continuous site progress monitoring and the most recent construction status report to the Georgia Public Service Commission by Georgia Power Company show improved construction progress on the nuclear islands, where nuclear quality requirements are the most demanding. Progress on the turbine buildings, cooling towers, and other balance of plant areas has been excellent almost from the onset of the project. Also, procurement of special equipment and components has proceeded extremely well. Recently, Unit 3 site completed another critical milestone: placement of the largest plant structural module, called the CA20 module. On March 8, 2014, the project team successfully placed the CA20 module into the Unit 3 nuclear island, shown in the accompanying photo. Weighing more than 2.2 million pounds, or 1,100 tons, and towering more than five stories tall, the module is the heaviest "lift" of the project to date. With a footprint of approximately 67 feet long by 47 feet wide, the critical module will house various plant components, including the used fuel storage area.

Other milestones achieved include:

- First nuclear concrete placement for Unit 3 was completed on March 14, 2013.
- Unit 3 CR-10 module or "cradle" was placed on April 11, 2013.
- Unit 3 containment vessel bottom head was placed in the nuclear island on June 1, 2013.
- Unit 3 CA-04 module or "reactor vessel cavity" was placed in the nuclear island December 4, 2013.
- Unit 3 turbine island lower foundation work complete, structural steel and equipment installation progressing as scheduled.
- Unit 3 cooling tower on schedule and concrete placements reach over 200 feet above ground.
- Procurement of major components is essentially complete.
- First nuclear concrete placement for Unit 4 was completed on November 21, 2013.

Photos of the construction progress can be viewed at the Southern Company website at http://www.southerncompany.com/what-doing/energy-innovation/nuclear-energy/gallery/new/

Continuous learning is a standard within the Project and the nuclear industry. As expected, there have been and will continue to be challenges associated with the first new units to be constructed in 30 years. The available fabrication and supply chain for nuclear quality materials in the U.S. has diminished over that time frame, which contributes to the challenge. These issues are being managed and the lessons learned incorporated in the construction of Unit 4 at Vogtle, which is proceeding on a faster pace and has experienced fewer challenges than Unit 3. An example of implementation of lessons learned is the efficient installation of rebar in the Unit 4 nuclear island in compliance with the licensed design to support placement of the Unit 4 basement concrete in November 2013. In addition, the Vogtle project is providing important lessons for SCANA's Summer project since it also utilizes AP 1000 reactors and is being built by the same EPC consortium (Westinghouse and CBI). Specifically the contractors have indicated that their experience at Vogtle has allowed project construction to proceed on pace, if not accelerate, at SCANA. Finally, the experience developed through the Vogtle project, and the Summer project, will benefit future deployments of the AP 1000 reactor.

RESEARCH AND DEVELOPMENT

SMALL MODULAR REACTOR ADVANCED RESEARCH AND DEVELOPMENT

Subcommittee. Dr. Lyons, when the Administration first proposed its small modular reactor (SMR) program in fiscal year 2012, it included an SMR advanced concepts program, which the Congress then funded. You've told us before that this program is focusing on improving safety, extending the lifetime of fuels, increasing reactor efficiency, proliferation resistance, and one or two other areas. This year's budget request proposes to consolidate this activity within Advanced Reactor Concepts.

Does this reflect a programmatic change in the type of advanced concept research you've been conducting for SMRs?

Where is the bulk of this SMR advanced concept research being performed, and are we seeing results from this program?

Dr. Lyons. The proposed consolidation of the Advanced SMR Research and Development (R&D) program and Advanced Reactor Concepts program into the Advanced Reactor Technologies (ART) program does not reflect a change in the research we are conducting. The focus of the research conducted under the ART Program will still be on improving safety, extending the lifetime of fuels, increasing reactor efficiency, proliferation resistance, materials qualifications, and licensing support.

Currently, the Advanced SMR R&D program funds research conducted at six DOE National Laboratories with most of the research being performed at three National Laboratories: Idaho National Laboratory, Argonne National Laboratory, and Oak Ridge National Laboratory (funding is descending in order). We are seeing notable results from this research such as the progress being made on Brayton Cycle energy conversion technology.

RESEARCH INTO NEXT-GENERATION REACTOR DESIGNS

Subcommittee. Secretary Lyons, one component of the Nuclear Energy program focuses on research into the next-generation of nuclear reactor designs. Sometimes referred to "Gen IV" reactors, these designs all have characteristics that could make them even safer, more economical, and produce less waste than today's plants. I'd like to delve into those for a moment.

There are obviously many different technology avenues for research on this front. Your 2015 budget request focuses on three areas: liquid metal-cooled fast reactors, fluoride salt-cooled high-temperature reactors, and high-temperature gas-cooled reactors. Would you lay out for us the landscape of next-generation reactor technologies?

Why has the program been focusing on this particular subset of reactor technologies?

If this program is successful, when could we see these technologies used in power plants?

Last year's omnibus appropriations bill included $12 million for industry-only competition within Advanced Reactor Concepts.

Can you update us on how you to plan to implement this funding, and have you considered using a performance-based approach to a concepts competition?

Building a manufacturing base starts with American designs for plants being built. Can you give us a quick overview of the competitive market for reactor designs worldwide?

Who's building new plants, and whose designs are they using?

What will it take to move some of the manufacturing for nuclear plants back to the United States, and what are your programs doing to that end?

Dr. Lyons. We are working on two broad categories of advanced reactors as follows:

- *High Temperature Reactors*: This category of reactors would be operated at high temperatures for the more efficient generation of electricity as a traditional use of nuclear energy, and possibly for a non-traditional use of nuclear energy such as to provide high temperature process heat for non-electric industrial applications. The more mature technology within this category is the high temperature gas-cooled reactor (HTGR), which is a graphite-moderated thermal-spectrum reactor, operated at temperatures above 700 degrees Celsius. The less mature concept is the molten salt-cooled (fluoride salt) high temperature reactor (FHR).
- *Fast-Spectrum Reactors*: This category could be used for electricity generation and could be part of different fuel cycle options. Also, this category includes the more technically mature sodium-cooled fast reactor (SFR), and the less mature lead-cooled (LFR), and gas-cooled (GFR) fast reactor.
- These and other next generation reactor designs are being developed in many countries and research and development (R&D) continues in the United States in support of a number of concepts. These technologies are not economically viable and in many cases, new technologies will be needed to further enable these new designs and innovative features. Certain aspects of the regulatory framework would need to be revised to accommodate these new technologies and design features, especially for designs that differ significantly from the large Light Water Reactor plants in operation today.

We are currently concentrating our resources on closing technology gaps identified for HTGRs and SFRs because of their inherent safety characteristics. Among the next generation designs which have been evaluated, these concepts have been shown to have the potential to reduce the potential for adverse consequences in the case of postulated severe accidents.

It is industry's decision as whether or when to deploy this technology or any technology. Currently fast reactor designs are not of sufficient technical maturity and are not economic. DOE's R&D efforts are targeted toward reducing uncertainties and technology gaps.

Last year's omnibus appropriations bill included $12 million for industry-only competition within Advanced Reactor Concepts.

DOE will again use the Technical Review Panel (TRP) process to identify R&D needs associated with viable advanced reactor concepts. As was done previously, DOE will use a Request for Information (RFI) to solicit information on concepts from industry. DOE is particularly interested in concepts that could achieve significant economic advantages over current Light Water Reactor (LWR) designs and that have the potential for deployment in the United States. DOE will evaluate how best to address the R&D needs applicable to the viable concepts identified by the TRP. The Department will use a performance-based competitive approach by first evaluating reactor concepts and identifying and prioritizing R&D needs through the reactor expert TRP process. DOE will competitively award funding for R&D technology tasks associated with the most viable concepts.

Seventy-three nuclear reactors are presently being built in 18 nations/territories (including Taiwan). Of these reactors, over half are being built in China (29) and Russia (10). China is building foreign-designed reactors, (including reactors designed by Westinghouse, France's AREVA, and Russia's Rosatom). Both China and Russia primarily build reactors manufactured domestically. Of reactors being built internationally (i.e. outside of the nation owning the technology):

a) Russian-designed reactors are being built in Belarus, China, India, Slovakia, and Ukraine.
b) French-designed reactors are being built in China and Finland.
c) Westinghouse-designed reactors are being built in China.
d) General Electric-designed reactors are being built in Taiwan.
e) Korean-designed reactors are being built in the United Arab Emirates.
f) German-designed reactors are being built in Argentina and Brazil.
g) Chinese-designed reactors are being built in Pakistan.

As a part of industry's development of emerging SMR technologies, industry is developing domestic component manufacturing capabilities and vendor supply chains elements needed to support the initial SMR builds. Industry is also independently developing plans to support a longer-term mass production mission as additional SMR plant orders are made.

BILL GATES AND TERRAPOWER: ADVANCED REACTORS WITHOUT REFUELING

Subcommittee. Secretary Lyons, a number of American and other companies are pursuing advanced reactor designs that don't need to refuel for several decades. This cuts down on proliferation risks, and it could dramatically reduce the amount of waste produced in a reactor. I believe Bill Gates is behind one of these designs.

Are these reactors feasible? What are the challenges to developing one of them?

We understand that these innovators are now pursuing opportunities for research and development overseas. Why are they doing so? What recommendations would you make for keeping these cutting-edge ideas here in the U.S.?

In the United States, we ordinarily require testing of fuel so that it is rated as safe for its lifetime. And it turns out that it's difficult to do that for fuel that lasts 30 years—I believe it's actually impossible to do so with our nation's test capabilities. Other nations are pursuing these designs. Do they have such fuel testing capabilities, or do they simply not require this testing?

Dr. Lyons. While theoretically feasible, the technology to build such a commercial reactor safely will require extensive research and development. The primary challenge lies with the required performance for the fast reactor fuel form to be used in these reactors, which will need to operate for more than twice as long as has been achievable in any fast reactor fuel to date.

While some testing in international facilities is being done to support R&D, fast reactor developers are taking advantage of the expertise provided by DOE National Laboratories to support their R&D efforts. As an example, TerraPower has established a Cooperative Research and Development Agreement (CRADA) with the Idaho National Laboratory (INL) to take advantage of INL's unique capabilities and long history of nuclear energy research to include operation of fast research reactors which are now shut down. This year TerraPower also enlisted the assistance of Los Alamos National Laboratory via a CRADA to prepare test specimens for insertion in the BOR-60 experimental fast reactor in Russia.

The United States does require that fuel be tested at extreme conditions so that it can be licensed by the Nuclear Regulatory Commission and be rated as safe for its lifetime. Prototypical testing capabilities necessary to qualify specialty materials and fuels for 30 years, such as required by TerraPower, require irradiation capabilities that exist in Russia, Japan, India and China because they require such testing for their fast reactor fuel and materials. Additionally, France and Russia are building new fast research reactors to enhance and expand their fast reactor fuel and materials experimental capabilities by 2020. We have international agreements with these partners through which we collaborate, providing our expertise as well as gaining useful data and insights.

MARKET AND WORKFORCE

NUCLEAR ENERGY FUNDING OPPORTUNITIES

Subcommittee. Dr. Lyons, there is some debate among interested parties around how your office should decide where grants go. Nuclear Energy research funding goes to national labs, universities, industry, and other research groups, and there has been some disagreement around how the Department should decide the allocation of funds to each of those types of institutions. For instance, your office has a Nuclear Energy University Program, which sets aside up to 20 percent from every program for university grant competitions.

This Committee has supported language in the past directing the Department to allow all types of organizations to compete for some portion of your office's funding.

Dr. Lyons, can you bring us up to speed on this issue? Have you been able to allow more types of organizations to compete, and let the best applicant prevail? What do you think is the right approach?

In the next 10 years or so, we expect a large number of retirements in the nuclear industry and related government programs. The Nuclear Energy University Program has invested a considerable portion of its budget to ensure our universities are filling the pipeline with nuclear engineers and scientists needed to support our energy sector and nuclear deterrent. In fact, the NEUP has awarded about $290 million to 89 colleges and universities in 35 states since 2009.

What is the process you use to assess how programs utilize the research conducted by the Nuclear Energy University Program?

Can you describe how the Integrated University Program in your office currently fits within this mission to train the next generation of nuclear engineers and scientists?

Dr. Lyons. The Office of Nuclear Energy (NE) strives to make full use of industry, universities and Department of Energy (DOE) national laboratories in accordance with their core competencies. NE funds industry, universities and DOE national laboratories through both competitive and direct mechanisms, as required to best meet the needs of NE. The competitive portion of NE's research and development (R&D) portfolio is accomplished in part by promoting integrated and collaborative research through NE's crosscutting programs: e.g., Nuclear Energy University Programs (NEUP); Nuclear Energy Enabling Technologies (NEET) Crosscutting Technology Development (CTD); the Advanced Test Reactor (ATR) National Scientific User Facility (NSUF); and NE's participation in Small Business Innovation Research (SBIR) / Small Business Technology Transfer (STTR). The Office of Science and Technology Innovation was established in 2012 with the primary objective of consolidating the aforementioned competitive research to promote efficiency and the effective use of resources.

NE engages the nuclear energy research community in a variety of ways as described below. Each of these programs is administered through competitive solicitations to ensure the best applicants prevail. Through NEUP, universities are able to compete for up to 20 percent of NE's annual R&D funding. University applicants are encouraged to establish collaborative teams with industry and DOE national laboratories. Up to 20 percent of the funding for each university-led NEUP project can be allocated to non-university collaborators.

Also, the NEET CTD program competitively solicits R&D proposals and is open to industry, universities and DOE national laboratories to conduct R&D to develop crosscutting nuclear energy technologies such as nuclear materials, advanced sensors and instrumentation, and advanced manufacturing methods. It should be noted that the leadership of these projects can be from any qualified domestic industry, university, or national laboratory entity, collaboration is strongly encouraged, and there is no limit on the sharing of project funds between collaborators, although industry-led projects will require 20 percent cost share per the provisions of Section 988 of the Energy Policy Act of 2005.

Additionally, in order to better engage with industry and help inform NE's R&D decision-making and program planning regarding advanced reactor technologies, the Department initiated the Technical Review Panel (TRP) process in 2012. The Department uses this process to examine potential R&D conceptual needs and how R&D investments can support advancement of technologies associated with those concepts. An industry-only competition is then used to solicit proposals and make cost-shared awards that address the R&D needs applicable to the viable concepts identified by the TRP. Four awards were made to industry in fiscal year (FY) 2013 with a combined DOE funding of $3.5 million, and these awards required a 20 percent industry cost share. This same TRP process is being employed in FY 2014 to identify additional R&D areas that could be supported via a competitive, industry-only solicitation. The Department anticipates making up to $12 million in such awards by employing the FY 2014 Advanced Reactor Concepts appropriations designated for an industry-only competition.

Further, the ATR NSUF provides researchers access to a variety of unique test reactors, hot cells and examination equipment to promote the highest quality research in the nuclear fuels, materials and reactor technology areas. Access to ATR NSUF facilities is available via competitive processes to university, national laboratory and industry researchers. Awards are based on feasibility, technical merit, relevance NE's mission, and cost.
Finally, NE contributes more than 3 percent of its annual R&D funding to the SBIR/STTR program that is administered for DOE by the Office of Science. Through this program, NE is able to effectively engage small businesses to address a broad range of its near-term R&D needs while stimulating technological innovation in the private sector, again, via a competitive process.

The above activities are supported by more than 30 percent of the NE R&D budget and are essential to balancing NE's R&D portfolio while encouraging creative solutions to the universe of nuclear energy challenges.

The Department has historically requested no funding for the Integrated University Program. The activities mentioned above, notably the NEUP, provides a more effective and efficient way of engaging and training the next generation of scientists and engineers to work in the nuclear energy sector. Also, the Administration believes that the nuclear industry will create incentives for students to enter nuclear-related programs and will establish programs to meet their needs.

On an annual basis NE's R&D programs determine their R&D priorities, the associated work scopes and the appropriate expertise to perform the work. Once specific needs and the method for addressing them have been identified, the Office of Innovative Nuclear Research begins working closely with NE's R&D programs to further develop and refine work that will be competitively solicited. Integrated efforts between offices ensure that all needs are met in an efficient manner. Initial work scopes are prepared annually by the NE R&D programs, with input, as appropriate, from the Office of Innovative Nuclear Research. Once complete, these initial draft work scopes are presented to the research community through a series of webinars and website postings. The research community is then given an opportunity to provide feedback which is incorporated into final work scopes as deemed appropriate by the NE R&D programs.

NE's R&D programs continue to be actively engaged throughout the solicitation process and act as relevance reviewers and provide final award recommendations. Once awards have been made, the NE R&D programs assume oversight responsibilities for the competitive awards and manage execution of these projects in a manner consistent with the other portions of their R&D portfolio.

NEUP R&D awards are issued as cooperative agreements and are therefore required to report performance and financial status on a quarterly basis. This reporting is accomplished through PICS:NE which is the system used to manage and oversee all of NE's R&D activities. By incorporating NEUP awards into this system, the programs are able to more effectively manage their entire R&D portfolio. In addition to quarterly reporting, NEUP awards are now undergoing an annual continuation determination which requires NE's R&D programs to evaluate each award for continuation into the next execution period. As awards near completion (typically year 2 of 3), the projects are evaluated again to determine the appropriate next steps. In some cases, the R&D is complete and no further action is required, with results documented and published as appropriate. In other instances further R&D may be required and the appropriate path forward would be determined as part of the annual planning process previously described.

NUCLEAR ENERGY INFRASTRUCTURE AND SECURITY

ADVANCED TEST REACTOR AT IDAHO NATIONAL LAB

Subcommittee. Secretary Lyons, the Advanced Test Reactor serves an important role for the health of our nuclear navy, as well as for civilian nuclear energy research and development. The ATR is an old reactor, but it's still going strong day-in and day-out.

What is the general health of the reactor, and has it been adequately funded to provide maintenance and upgrades necessary for it to last?

What projects and upgrades to the ATR are still outstanding but were not proposed in this year's budget request?

Dr. Lyons. While the Advanced Test Reactor (ATR) has been operating for more than 45 years, the ATR's unique design allows for operation well into the future. Continued investment in maintenance and repair activities, including the upcoming Core Internals Change-out (CIC), will ensure that the reactor operates safely in support of Nuclear Energy (NE) and Naval Reactor (NR) missions.

Overall, the general health of the ATR has improved in recent years as evidenced by reduced deferred maintenance, decreased unplanned shutdowns due to equipment failure, and an increased number of operating cycles. The FY 2015 President's budget request for NE and NR continues to sufficiently support operations, maintenance, and investments in ATR through activities such as the CIC and the ATR Life Extension Program (LEP), which will be completed by the end of FY 2015.

The ATR will continue to require maintenance and infrastructure investments, including replacement and refurbishment of major components and systems. The Department is evaluating and prioritizing the outyear requirements of the ATR to ensure alignment between resources and NE and NR research and development needs. Near term effort is focused on improving the outyear planning and prioritization processes. Performance in this area is essential for the Department to ensure funding is aligned with requirements.

FOSSIL ENERGY

SOLID OXIDE FUEL CELLS (SECA) PROGRAM

Subcommittee. Mr. Smith, the Solid Oxide Fuel Cells program has supported research into an emerging technology that could change the way we use natural gas, including highly-efficient distributed generation. The program, if seen to completion, could create substantial benefits for American jobs, manufacturing, and our energy sector.

This year's budget request once again proposes to eliminate this program. Congress has spoken loud and clear by restoring funding in previous fiscal years.

Why does the Department continue to prioritize this program so low?

Mr. Smith. DOE has to make programmatic decisions based on balancing priorities critical to advancing the nation's energy goals. In doing this, FE has prioritized R&D activities on CO2 capture and storage technologies focused on eliminating deployment barriers for both new and existing power plants.

The requested funding level for FY 2015 will allow continuation of the Fuel Cells program's focus on materials development. The program will address the materials-related technical challenges to commercialization, specifically cell performance, reliability and durability.

Subcommittee. Where do we stand with this technology, and can you discuss some of the advances that have been achieved over the last several years?

Mr. Smith. FE actively manages the SOFC program. As a result of carryover funding from the FY 2013 budget, the SOFC program portfolio of approximately 25 projects has been funded through the end of FY 2014. Congress appropriated $25 million for FY2014. Two Funding Opportunity Announcements (FOA) were recently released by NETL. One FOA is directed towards addressing the technical challenges to commercialization, specifically cell performance, reliability and durability. The purpose of the second FOA is to advance and test progressively larger SOFC systems that will be the building block for full-scale central power generation systems. The present focus is to validate the stack and module technology in a thermally self-sustaining fuel cell system configuration at the 250 kW level.

Since its inception in 1999, the SECA program has made significant progress; stack cost has been reduced by a factor of 10, stack size has increased by a factor of 25, and the rate at which cells degrade has been reduced by a factor of 10. While progress has been impressive, the program must address additional technical and cost issues before there is widespread viability and acceptance of the technology for commercial use. Driven by industry feedback and systems analysis, the SOFC program is pursuing R&D to address the remaining technical hurdles, with particular emphasis on cell performance, stack reliability, endurance, and cost reduction.

NATURAL GAS DEMONSTRATION PROJECT

Subcommittee. Mr. Smith, this year's budget request includes $25 million for a natural gas demonstration project to capture and store more than 75 percent of carbon emissions from a natural gas power system. This is eerily similar to the $25 million natural gas prize this Committee rejected in last year's request.

Can you explain to us how this year's proposal differs from last year's?

Mr. Smith. The FY15 effort will be implemented through a competitive funding opportunity resulting in at least one cooperative agreement award to demonstrate technology to capture and store more than 75 percent of the carbon from treated emissions from a natural gas power system.. The previous approach would have resulted in a competition where a lump sum prize would have been awarded to the first natural gas combined cycle project with carbon capture and storage to achieve operations and performance targets. The FY15 approach will allow for broader natural gas power system eligibility and more interaction with the award recipients during the project development process resulting in better DOE oversight of the project throughout the lifecycle of the award.

Subcommittee. Can you also explain the decision to include funding for a natural gas demonstration project within your office's coal program, as opposed to the natural gas program? If funded, would you have any object to re-locating this activity to the Natural Gas portfolio?

Mr. Smith. Programmatic categorization by fossil fuel type has become an inaccurate representation of the areas of expertise that have been built within FER&D. In general, coal and natural gas power plants have more in common than a natural gas power plant and environmental technologies at the drill pad. Placing this activity in the coal program leverages the existing knowledge and project management capabilities associated with power generation systems and capture technologies needed to implement this activity. The advanced technologies and processes to capture CO_2 from natural gas are similar to those being developed by the coal program for coal fired power plants. Keeping this activity in the coal program directly benefits the existing carbon capture activities as many of the technologies currently being developed for coal plants will be likely candidates to be tested on natural gas power systems and will provide complementary design data about system performance under different operating and flue gas conditions.

Subcommittee. With this demonstration project, the Department is proposing to triple its natural gas program, from $21 million to $60 million. Does this represent a fundamental shift in research for your office, and should we assume this to be the focus in future budgets?

Mr. Smith. The Office of Fossil Energy budget request continues to maintain priority on carbon capture and storage research and development. While this demonstration project for carbon capture is for natural gas applications, it leverages the work and expertise on development of carbon capture technologies which lies within the Coal Program. The mission of the CCS and Power Systems R&D activities is to support secure, affordable, and environmentally acceptable near-zero emissions fossil energy technologies. Thus, the needs and priorities for future budget requests will be evaluated at the appropriate time, taking into consideration Departmental priorities as well as technological progress and market conditions.

HYDRAULIC FRACTURING RESEARCH

Subcommittee. In last year's budget request, the Administration proposed to fund a research effort involving the Department of Energy, the Environmental Protection Agency, and the U.S. Geological Survey, aiming to "understand and minimize the potential environmental, health, and safety impacts of shale gas hydraulic fracturing." The Department of Energy proposed $12 million of its budget towards this effort.

Last year's omnibus appropriations bill provided the requested funding for these efforts but restricted funding of $6 million or more until submission of an interagency research plan submitted by the Department. We have yet to see that interagency plan.

Mr. Smith, can you describe exactly how your office is collaborating with the EPA and USGS?

Are funds currently being spent on this effort absent submission of that plan? If so, how much?

Mr. Smith. Ongoing discussion between the agencies, via a Steering Committee and its Technical Subcommittee, to develop the Multi-Agency Strategy, is the basis for most of the coordination and collaboration. Currently DOE is finalizing decisions regarding the Fiscal Year 2014 appropriations of not more than $6 million for this work as indicated in the Consolidated Appropriations Act, 2014 (H.R. 3547) Division D – Energy and Water Development and Related Agencies Appropriations Act, 2014 Explanatory Statement.

Activities being considered for these FY 2014 funds include a lab call and a funding opportunity announcement for research related to five of the seven research topics that comprise the Multi-Agency Strategy. The five topics that are directly related to DOE core competencies are: resource characterization, water quality, water availability, air quality, and induced seismicity. Identification of specific research in which DOE will invest these FY 2014 funds will be informed by the insights gained from completed and ongoing research in the DOE research portfolio and that of the other agencies.

Subcommittee. It is my understanding that last year's omnibus appropriations bill did not include funding for EPA to begin its portion of the study. How does that impact the collaborative effort moving forward?

How exactly are the agencies collaborating on this research?

Mr. Smith. Most research activities involve utilizing the core competencies of the respective agency and planning for these activities requires close coordination among the three agencies. Ongoing discussion between the agencies to develop the Multi-Agency Strategy has been the basis for most of this coordination. For DOE, coordination has involved highlighting from ongoing or completed projects the key research results or insights that have relevance to the other agencies. The research activities that depend on collaboration by each of the three agencies are more complex and require the interaction of different competencies. The act of collaboration does not necessarily require interdependent activities, but does involve the integration of insights and information that are derived from the results of research. For projects that involve collaboration, DOE's research focuses on addressing issues that involve its core competencies. Results from these projects are shared with the Steering Committee, add to the body of knowledge, and make it possible for larger questions to be addressed.

METHANE HYDRATES – A NEW FRONTIER

Subcommittee. We are beginning to see some large successes reported on the Department of Energy's efforts to extract methane from methane hydrates in the arctic. The volume of methane in those deposits is staggering, and continued progress on the technology seems well worth the investment. This year's budget request proposes to nearly double this program to $15 million.

Can you describe the projects this program is working on now, and how what would these additional funds support in fiscal year 2015?

Mr. Smith. In FY12 and FY13 appropriations were used to fund Funding Opportunity Announcement's (FOA) to re-engage the research community and the National Lab's in the development of a comprehensive portfolio of projects that address critical issues in methane hydrate R&D. A total of 21 projects were awarded supporting laboratory, modeling (including analysis of the data acquired during the successful arctic testing during FY12), and to a lesser extent, field research opportunities in the areas of resource characterization and increasing the understanding of methane hydrate's role in the natural environment. For FY14, an FOA was issued to solicit applications for selection and award that focus on two technical topic areas: (1) field evaluation of potential resource recovery through scientific tests in Alaska, and (2) field programs for marine gas hydrate characterization. In FY15, the increased appropriation requested will be utilized to fund the field projects awarded through the FY14 FOA.

Subcommittee. Can we expect to see this level of funding of $15 million as what's needed to continue making progress in gas hydrates research?

Mr. Smith. At this point, $15 million provides adequate funding to ensure steady progress towards our goal of furthering the scientific understanding of naturally-occurring gas hydrates; understanding the links between methane hydrates and global environmental processes; and the resulting resource, hazard, and environmental implications.

Subcommittee. Last year, Japan announced a major success with underwater hydrates extraction. Can you elaborate on their success, and does this mean we're falling behind the competition—and underfunding our program?

Mr. Smith. Last years' successful test was the first of two offshore production tests planned in the Japanese methane hydrate research program. Its program also includes technological studies on production methods, flow testing, environmental impacts, and resource assessments. The test took place in waters 1 kilometer deep, where the 60-meter-thick methane hydrate reservoir was 270 meters beneath the sea floor. After drilling a production well and two monitoring wells, the depressurization method was applied to successfully produce offshore methane hydrate for six days, averaging about 20,000 cubic meters a day. Such marine deepwater testing is quite expensive – likely costing $150 to $200 million (actual cost data have not been published), whereas the 2012 onshore field test in Alaska was conducted with $15.6 million in federal funding combined with $13.4 million from our cost-share partners. The funding that Japan is prepared to invest in methane hydrate technology is motivated by their more urgent need for natural gas.

Subcommittee. Mr. Smith, the FutureGen project, to which $1 billion of stimulus funds were devoted in 2009, has been on a long path towards completion. But it appears to have cleared the main hurdles put before it so far, including approval at the state level, securing a power purchase agreement, and a final Environmental Impact Statement.

What do you see as the main obstacles ahead between now and the beginning of construction?

Mr. Smith. The main obstacle that must be overcome before construction can begin is financial close, which includes the achievement of a number of prerequisites that private investors and lenders need before they will commit to providing more than $600 million in non-federal funding that is required for construction. While a number of critical hurdles have been cleared, including recent issuing of the first draft Class VI Underground Injection Control Permit for geologic storage of carbon dioxide with a final permit expected in September 2014, a number of other challenges remain. These challenges include but are not limited to signing contracts for (a) engineering, procurement and construction, (b) operation and maintenance, and (c) major commodities; and timely resolution of two current and any future appeals of state or federal agency actions.

Subcommittee. The project's funds will expire five years after funding was obligated, which is rapidly approaching. When will the project be completed, and how does the Department plan to proceed to ensure that funds do not expire?

Mr. Smith. At this time, the FutureGen project is maintaining an aggressive schedule to ensure the funds are expended in a timely manner. As with any major demonstration project, meaningful delays in securing the necessary non-federal cost share, issuing of permits, or execution of agreements, can jeopardize a project's ability to maintain its planned schedule and expenditure of funds. DOE continually analyzes the scheduled progress and benchmarks for achieving all of the prerequisites in time to start construction before some or all of the Recovery Act funding expires on September 30, 2015.

OIL SHALE

Subcommittee. Mr. Smith, we hear a lot about the Administration's "all of the above" approach to our energy problems in order to reduce our reliance on imported oil. In fact, the U.S. Geological Survey released a report last year in which it found significant potential energy resources of shale oil.

I understand there are significant technical obstacles to extracting oil from these oil shale formations. Currently technologies require large quantities of water during extraction, and because the deposits are actually a precursor of oil, we need to heat them to turn the substance into oil.

Mr. Smith, what is the appropriate role for government research, especially given the incredible potential here? What is the government doing to realize this untapped resource?

Mr. Smith. America's abundant unconventional oil (including oil shale) and natural gas resources are critical components of our Nation's energy portfolio. The environmentally prudent development of these resources enhances our energy security and fuels our Nation's economy. In addition to the significant technical challenges to development of U.S. oil shale, the more difficult issues related to the commercialization of domestic oil shale appear to be related to high capital costs, uncertainties regarding oil shale development regulations, and most importantly, environmental considerations, rather than process-related technical challenges.

Subcommittee. Mr. Smith, the Environmental Protection Agency has proposed final rules for greenhouse gas emission standards for fossil-fueled power plants, which has proposed an emissions limit of 1,100 pounds of carbon dioxide per megawatt-hour of electricity generated by new coal-fired power plants. Coal-fired plants would require controls to capture, compress, and store underground about 40 percent of the carbon dioxide they produce.

I'd like to take a minute to understand the technological landscape of these CCS technologies. What do current CCS technologies look like, have they been adequately demonstrated, and how much do you anticipate they will increase the cost of electricity for a coal-fired power plant?

Mr. Smith. CCS technology has been and continues to be deployed on a range of projects. There are twelve large-scale CCS projects in operation worldwide today, with another eight anticipated to come online before 2020. Commercially available first generation CCS technologies consist primarily of solvent based systems designed to separate CO_2 from flue gas and synthesis gas. Our Fossil Energy R&D (FE R&D) programs are working to deliver the next generation of advanced lower-cost CCS technologies, which will consist of advanced solvent, sorbent, membrane based processes, and a few novel processes, that will enable more widespread deployment.
The cost of CCS technologies depends on a number of factors, including the technology used (solvents, sorbents, etc), the type of coal plant (supercritical PC, ultra-supercritical PC, oxycombustion, or IGCC), the amount of CO2 emissions removed, the economies of scale, and whether EOR or other techniques are deployed. How these costs affect the wholesale price of electricity similarly depends on a number of factors, including rate recovery, the price of natural gas, federal and/or state assistance, etc. The Department has identified and is currently supporting engineering pathways to better economic performance that will continue lowering costs over time, in a way that will help the power industry provide reliable, low-cost electricity to millions of customers.

The Department is also aggressively pursuing developments and deployment of new, advanced technologies which will provide both lower costs and higher performance, which could ultimately reduce the cost penalty for electricity from new coal-fueled power plants with carbon capture.

Subcommittee. With its rule for greenhouse gas emissions, EPA is now obligated to promulgate guidelines for existing sources, which should occur in June of this year and take another year to finalize.

Does this budget request take into account these new regulations coming into effect in its proposed research portfolio?

Mr. Smith. The FY15 budget request focuses on developing second generation and transformational CCS technologies applicable to both new and existing plants. DOE has developed technologies in the past and is working on technologies in the current research and development portfolio, which would improve the efficiency and environmental performance of existing power plant operations. These technologies could provide the states and public utility commissions viable options in their efforts to reduce greenhouse gas emissions from existing sources and remain or become compliant with current and future federal guidelines. In addition, the program continues to develop advanced carbon capture technologies that could be used to retrofit existing facilities, if necessary.

Subcommittee. What does the next generation of CCS Technologies look like? How will they reduce the cost of implementing these regulations?

Can you describe some of the proposals in this budget request that will help you develop the next generation of CCS Technologies?

Mr. Smith. The next generation of CCS technologies will result in lower cost of carbon capture and storage, and improved energy efficiency. This will occur through technological advancements in the Coal R&D Program that improve the efficiency of new and existing power plants, more energy efficient and lower cost carbon capture technologies, and improved understanding and reduction of the risks associated with geologic storage of carbon dioxide through field injection tests, improved monitoring technologies and advanced modeling and simulation. Specific novel technologies cover a wide technology space, ranging from novel membranes, phase-change capture systems, hybrid systems, and advanced sorbents and solvents.

As indicated previously, the FY2015 budget request supports the development of second generation and transformational CCS technologies. For example, the request in carbon capture continues to emphasize post-combustion capture technology development by continuing small slipstream tests (approximately 1 MWe in scale), initiates large-scale slipstream tests (approximately 10+ MWe scale) of second generation technologies, and continues laboratory and bench-scale research of transformational capture technologies. For Carbon Storage, the request continues field injection tests and Core R&D activities, while also initiating efforts to further characterize onshore and offshore carbon storage potential. In Advanced Energy Systems, key proposals include:

- initiation of pilot-scale design and construction for pressurized oxy-combustion and chemical looping systems which have potential to significantly lower the cost of capture;
- new efforts in Turbines research on high pressure, high temperature combustion and turbines materials;
- Solid oxide fuel cells development work, focused on durable materials development; and
- Continuation of existing efforts on advanced turbines and gasification systems and components, such as advanced oxygen separation.

Crosscutting Research efforts continue development of promising second generation technologies for plant optimization technologies and increases emphasis on computation tools development such as the National Risk Assessment Partnership and Carbon Capture Simulation Initiative, which will help ensure safe permanent storage of carbon dioxide and accelerate development and deployment of second generation and transformational carbon capture technologies.

Subcommittee. Mr. Smith, coal accounts for 37 percent of our electricity, and it's as important as ever to make sure we use this resource well. Increasing the efficiency of our coal plants by just 1 percent would add a substantial amount of power generation to the grid.

Mr. Smith, what work is your office doing to increase coal utilization and the efficiency of our existing power plants?

Mr. Smith. Numerous opportunities to improve efficiency can be found within several of our R&D programs for new and improved processes;

- Technologies developed under the Turbines Program will provide an improvement of 3 - 5 % efficiency points by 2015 above the baseline and a 4 % points improvement (14 % above baseline) in overall IGCC plant efficiency. This is with CCS and reduced CO_2 emissions for multiple fuel types, including syngas and natural gas.

- Low cost sensors and controls to better optimize the operations of the power plant,
- High temperature materials research aimed at increasing the steam temperature in existing power systems and advanced,
- Improved water management and reduced overall consumption, and
- Advanced capture technologies that reduce energy penalties and water demands.

The Fossil Energy Research and Development has played a critical role to that end, both in improving existing technologies and inventing entirely new ones.

Subcommittee. If you were provided an additional $50 million or $100 million to further advance second-generation CCS Technologies, how would you propose to spend it?

Mr. Smith. The FE R&D program, under the FY15 request, is supporting a robust and substantial CCS portfolio through the CCS technology program and through ongoing CCS demonstration projects supported by more than $6 billion in prior-year appropriations (including $3.2B from ARRA). At present we feel the current request is sufficient to achieve the mission.

LNG EXPORTS

Subcommittee. Mr. Smith, this Committee has expressed its concern about the process and backlog within the Office of Fossil Energy for adjudicating pending applications for natural gas export, particularly to non-Free Trade Agreement countries. I applaud the Department's movement on four of these applications within the last year. But by my last count, the Department still had 25 applications awaiting DOE review. Some of those applications have been pending at the Department for more than two years.

This Committee has supported a clearly communicated, timely process to make an appropriate determination on each of the pending applications. Can you talk us through your plan to do just that?

Last year's House bill included a directive for your office to submit a report within 30 days of enactment on its plan to finish consideration of all applications filed with the Department. It's now been more than 60 days since passage of the omnibus – when can we expect to see that report?

Mr. Smith. The Department is processing the pending applications to export liquefied natural gas to non-free trade agreement countries on a case-by-case basis as expeditiously as possible. The orders on export applications are complex documents that must withstand public and legal scrutiny. In December 2012, the Department established an order of precedence to evaluate pending applications to export liquefied natural gas to non-free trade agreement countries based in part on the date that the application was filed and in part on whether the Federal Energy Regulatory Commission had authorized the pre-filing environmental review of the related liquefaction project.

The Department is currently working on the report and will work to transmit it to Congress as expeditiously as possible.

Subcommittee. Can you discuss some of the general issues the Department takes into consideration when analyzing natural gas exports?

We've seen a lot of reports regarding the national security interests of U.S. natural gas supporting our allies – I'm particularly thinking of the ongoing crisis in Ukraine and its impact on the European energy market, which imports about 30 percent of its gas from Russia. Are you aware of any ongoing discussions regarding the export of liquefied natural gas to support Europe's energy market?

Mr. Smith. For applications requesting authority to export LNG to countries that do not have free trade agreements (FTAs) requiring national treatment for trade in natural gas, DOE conducts a full public interest review. While section 3(a) of the Natural Gas Act establishes a broad public interest standard and a presumption favoring export authorizations. In prior decisions, however, the Department has identified a range of factors that it evaluates when reviewing an application for export authorization to non-FTA countries. These factors include economic impacts, international considerations, U.S. energy security, and environmental considerations, among others. To conduct its review, the Department looks to record evidence developed in the application proceeding. Applicants and interveners are free to raise additional issues or concerns relevant to the public interest.

With respect to exports of liquefied natural gas to support Europe's energy market, increased production of domestic natural gas has significantly reduced the need for the United States to import liquefied natural gas. In global trade, liquefied natural gas shipments that would have been destined to U.S. markets have been redirected to Europe and Asia, improving energy security for many of our key trading partners.
The Department authorizes the export of the natural gas to either FTA or non-FTA countries. The authorization is provided to the company, who applies, not to a country. The final destination for LNG cargoes will be determined by commercial decisions and market forces.

Foreign companies interested in purchasing U.S. liquefied natural gas for export would contract private sector entities holding U.S. export authorizations.

QUESTIONS FROM CHAIRMAN SIMPSON

ADMIRALTY INLET PILOT TITLE PROJECT ENVIRONMENTAL ASSESSMENT

Chairman Simpson. The Federal Energy Regulatory Commission ("FERC") has adopted a final environmental assessment ("EA") on FERC Project No. 12690-005/Admiralty Inlet Pilot Title Project ("Project"), and the Department of Energy ("Department") is a cooperating Agency with FERC regarding the EA (DOE/EA-1949). The Department has previously provided financial assistance for Project activities, and is considering an additional $10 million grant for the Project which will trigger various mandates under the National Environmental Policy Act ("NEPA"). The Committee understands that questions have been raised on the appropriate separation distance between the Project and a major international fiber optic submarine telecommunications cable between the U.S. and Japan ("Cable"). Several Members of Congress have raised questions on the issue of separation between submarine cables and experimental marine energy uses such as the Project, and the Federal Communications Commission ("FCC") has asserted that neither it nor FERC has sufficient expertise to determine the appropriate separation between submarine fiber optic cables and other marine uses (see December 13, 2013 letter from members of the Energy & Commerce Committee).

Does the Department believe it has sufficient expertise and access to knowledge to reasonably assess the issue of separation between the Cable and the Project, and has the Department considered and evaluated the import of available industry guidance on the question of separation? Please provide to the Committee adequate information to establish the Department's position. If the Department indicates that it does not possess sufficient expertise/knowledge, how will the Department conduct its independent assessment of the EA on the Project regarding the issue of separation in light of this deficiency, so as to ensure that federally funded experimental marine energy technologies, such as the Project, will not endanger critical telecommunications infrastructure?

Department of Energy. DOE is confident that the analysis conducted by the Federal Energy Regulatory Commission (Commission) in the Environmental Assessment provides adequate information for DOE to make an informed decision in compliance with the Council on Environmental

Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA (40 CFR Parts 1500–1508) and DOE's NEPA implementing procedures (10 CFR Part 1021.330 et seq.). The Department of Energy is currently evaluating the Environmental Assessment (EA) and its supporting data and has not made a final decision on DOE's action to fund the Snohomish Public Utility District of Snohomish County (SnoPUD).

An integral part of the FERC and DOE process also involved consultation with outside agencies that have the technical expertise that assisted in the analysis in the EA. This included the Federal Communications Commission (FCC) and the Naval Seafloor Cable Protection Office (NSCPO). DOE does not have technical telecommunication cable experts on staff but has cooperated and had an active role with the Commission throughout their NEPA and Licensing processes. DOE has participated in the Technical Meetings organized by the Commission in which the separation distances were thoroughly discussed with all concerned parties. Based on SnoPUD's proposed distances of both 170 meters and 249 meters between the turbine locations and telecommunications cable, as well as the mitigation proposed that would further reduce the likelihood of impacts to the PC-1 cable, both the FCC and the NSCPO have responded that neither oppose the Commission's Licensing of the SnoPUD project. Upon DOE's final decision, all mitigation and provisions established during the NEPA process would be incorporated and enforced through DOE's funding contract.

Chairman Simpson. The FCC has convened a federal advisory committee named the Communications Security, Reliability and Interoperability Council (CSRIC) that is addressing, amongst other things, recommendations/guidelines for safe separation distances between submarine fiber optic cables and other sea bed uses, including for projects similar to the above described Project. What, if any, interaction and contribution has the Department made to the CSRIC process regarding the issue of separation? In light of the fact that the CSRIC process is ongoing, does the Department intend on adopting a final environmental analysis on the Project prior to the completion of the advisory committee's work on the separation issue? If so, has the Department considered the ramifications of doing so, including creating a precedent for future projects?

Department of Energy. A representative from DOE's Office of Electricity has participated in CSRIC, and the Office of Energy Efficiency and Renewable Energy is also willing to coordinate with CSRIC if asked.

Though in general DOE has been in consultation with CSRIC, the Department will make its NEPA decision independent of the CSRIC process. EERE believes the fact that SnoPUD's project is an experimental prototype project makes it less likely to set precedent. It will however, provide valuable information and data that can help the committee come to some meaningful decisions for larger scale MHK projects.

INTELLECTUAL PROPERTY PROTECTION AT EERE

Chairman Simpson. EERE programs support the development of new energy efficient technologies. Some have argued that too many of our best new energy technologies are being commercialized overseas. You have a responsibility to help move the best American energy technologies forward with economic competitiveness in mind. How is DOE making sure our investments result in jobs and factories here in the US? Do you include any conditions about intellectual property in your funding agreements with companies?

Dr. Danielson. In 2013, $254 billion was invested globally in clean energy, a 450% increase since 2004—and trillions more will be invested in the years ahead. China recently pulled ahead of the U.S. in clean energy investment after we gained the investment lead in 2011. Yet the U.S. energy industry as a whole is systematically underinvesting in research and development. This significant underinvestment in energy research and development by the private sector makes government support for applied clean energy research, development, and demonstration (RD&D) crucial for our future competiveness and economic prosperity.

DOE-supported investments can help bring together manufacturers, research institutions, suppliers, and universities to develop and de-risk foundational technologies that will allow U.S. manufacturers to keep their competitive advantage in the production of products for the clean energy economy, and develop high-impact manufacturing technologies for traditionally energy-intensive industries. With industry's input, EERE has identified a variety of activities that could help U.S. manufacturers remain competitive in the clean energy economy. For example, developing next-generation foundational technologies, like advanced composite materials and structures or wide bandgap power electronics, can enable the manufacture of low-cost, high-performance products with broad applicability for manufacturers in clean energy industries. Furthermore, DOE-supported technical assistance activities help U.S. manufacturers reduce their energy consumption and boost their energy productivity by leveraging technical expertise to deploy energy-efficient manufacturing processes, technologies, and practices. In FY 2015, EERE is requesting $554 million for RD&D activities across our Advanced Manufacturing, Vehicles, Bioenergy, Solar, Wind and Water, Buildings, and Fuel Cell Technology Offices to increase the energy efficiency, productivity, and competitiveness of U.S. manufacturing.

DOE recognizes the many benefits of U.S.-based manufacturing within the clean energy economy, including job creation and high-tech intellectual property generation. EERE has made progress in how it treats intellectual property utilization for companies and universities receiving taxpayer resources for RD&D projects, and is mindful of the objectives of related legislation, such as the Patent and Trademark Law Amendments Act ("Bayh-Dole").

For example, motivated in part by this Committee's report language, starting in FY 2014, EERE has successfully built into its standard operating procedures, and where appropriate: the requirement that applicants to EERE competitive Funding Opportunity Announcements submit U.S. manufacturing plans as a component of their applications (or agree that subject inventions be substantially manufactured in the U.S.); the requirement that EERE consider U.S. manufacturing plans when evaluating applications; and the requirement that EERE negotiate, track, and enforce U.S. manufacturing commitments as part of its cooperative agreements. These efforts will help foster U.S. innovation, strengthen manufacturing competitiveness, and provide our research partners the assurance that EERE is dedicated to leveraging the clean energy economy's competitive opportunity.

EERE—WATER POWER PROGRAM:

Chairman Simpson. I understand that the Water Power Program at EERE is developing the Hydroelectric Production Incentives (HPI) program authorized by Section 242 of the Energy Policy Act of 2005. The statute was enacted to support the efforts of non-federal entities to take advantage of the more than 80,000 dams and conduits that currently produce no power at all.

Please provide the committee an update on the development of this program, and how you plan for it to accelerate the conversion of non-powered dams across America.

Dr. Danielson. Capital costs and environmental impacts of dam construction have already been incurred at non-powered dams (NPDs), so adding power to the existing dam structure can often be achieved at lower cost, with less risk, and in a shorter timeframe than development requiring new dam construction. These attributes, combined with the reliability and predictability of hydropower, make NPDs a potential source for expanding the nation's renewable energy supply. The Department's resource assessments have determined that there are about 12 gigawatts of potential capacity from these non-powered dams, with the 100 largest capacity facilities providing a potential capacity of 8 GW.

The Department is implementing Section 242 of the Energy Policy Act of 2005 with $3.6 million of appropriated hydropower funding. Eligible entities are developers who added hydropower to non-powered dams or conduits between 2005 and 2015, but where the original dam or conduit was built prior to 2005. Because the program has been appropriated for one year, DOE plans to accept applications for generation produced in calendar year 2013. DOE will distribute available appropriated funds in proportion to the qualifying amount each eligible applicant identified as net generation of kWh in calendar year 2013.

DOE has also developed new high efficiency, fish friendly turbines at a small scale. The FY 2015 budget includes funding to demonstrate this new turbine technology at larger scale under real operating conditions at non-Federal dams. If this demonstration is successful, it provides hydropower developers another option to consider when they are able to power existing NPDs or upgrade older facilities.

QUESTIONS FROM MR. NUNNELEE OF MISSISSIPPI

ADVANCED REACTOR CONCEPTS

Mr. Nunnelee. Dr. Lyons, I was very pleased to see that NE last year had an industry-only competition in the field of advanced reactor concepts. I had 3 concerns: that it was just for a total of $3M, the largest award was $1M, and that it funded only advanced reactor technologies, not concepts. Since you had very little money to work with, your choices were understandable. However, we liked the idea so much that in FY14 the Congress gave you $12M for ARC. So we hope that this year you'll be able to fund work in advanced reactor concepts, not just generic technologies, and make grants that could be as high as $4-$5M for work done through FY16.

I believe that we need to develop new reactor concepts, not individual generic technologies, which could result in nuclear generated electricity that is economically competitive with natural gas in the $5-6 range. We could work on generic technologies forever, it certainly would be fun, but it is hard to understand how we get to the promised land of economically competitive nuclear power without setting goals for reactor performance and challenging industry to embrace high performance concepts through a competition.

Could you tell us your specific plan in FY14 to drive the performance of future nuclear reactors so new reactor concepts are much more economically competitive in the energy marketplace? I don't understand why you would want to repeat exactly what you did last year now that you have much more money to work with.

Dr. Lyons. DOE will again use the Technical Review Panel process to assess the viability of new reactor concepts against a range of criteria which includes safety, security, economics, waste minimization, nonproliferation, technical maturity, and market attractiveness. We use this process to specifically identify those priority R&D needs that industry requires to support the development of viable concepts. As was done previously, DOE will use a Request for Information (RFI) to solicit information on concepts from industry. DOE is particularly interested in concepts that address proliferation concerns and could achieve significant economic advantages over current Light Water Reactor (LWR) designs, and that have the potential for deployment in the United States. We anticipate that R&D opportunities will be identified across several technical areas. In some cases, the research opportunities may be specific to one particular concept. In other cases, a single R&D activity might support multiple concepts. While these may appear to be individual generic technologies, they are addressing the fundamental technology gaps identified by industry to support their specific concepts. An industry-only Funding Opportunity Announcement is planned for late this fiscal year to solicit cost-shared proposals which address the priority R&D needs applicable to the viable concepts.

PRESIDENT'S COMMITMENT TO ADVANCED REACTOR CONCEPTS

Mr. Nunnelee. Dr. Lyons, I have several concerns about the FY15 President's Budget commitment to work on Advanced Reactor Concepts – that is, reactors that are not our present light water reactors. My concerns are: first, that the request, by renaming the account Advanced Reactor Technologies from its present name, Advanced Reactor Concepts, signals a retreat from funding work on reactor concepts toward work on individual generic technologies; second, that it does not fund the FY14 small effort to fund an industry-only competition; and third, that by combining money that was used to fund Light Water SMR work ($22.9M) with other non-light water reactor ARC work ($59.9M), it makes it easy (i.e., without a formal reprogramming request) for the Administration to take funding that we would like to see go for developing advanced reactors and use it instead for additional work on LWRs.

I would be against making these changes. I'd like to see more work on new concepts rather than generic technologies, I want to continue our industry-only competition effort, and I want to make it clear that not less than $59.9M, the FY14 amount, should be spent on advanced reactor concepts work, which means non-LWR.

I'm sure you can see my concern about your request making it easy to take money from Advanced Reactor Concepts (ARC) work to put it into more LWR work. If we were to agree to combining these accounts while keeping the ARC title for the new account, would you support language that, for example, would say that not less than the $59.9M funded in FY14 would be used for Advanced Reactor Concepts work?

Dr. Lyons. First, as stated above, the proposed consolidation reflects our desire to develop new nuclear technologies that can be deployed by industry in the commercial market place. We want to do this in the most efficient way, leveraging our resources and better coordinating and integrating the efforts of existing and prior advanced reactor subprograms. In clarification, the $22.9M in FY 2014, under the Advanced SMR R&D program, was associated with advanced (non-LWR) efforts, as well as the $59.9M under Advanced Reactor Concepts. All of the activities proposed under the $70.24M, FY 2015 request for Advanced Reactor Technologies, are either directly associated with advanced reactor technology or are generic in nature and can be applied to both advanced as well as LWR technologies. As described in the detailed justification section of the FY 2015 Budget Request for the Advanced Reactor Technologies (ART) subprogram, activities in this subprogram are in support of advanced reactor types, primarily high temperature reactor technologies, or fast reactor technologies. Work on technologies such as advanced reactor instrumentation and controls have broader applications. Accordingly, the DOE would not object to language that further clarifies that the request only fund research and development of technologies that support advanced non-light water reactor concepts.

ACCIDENT TOLERANT FUELS

Mr. Nunnelee. Dr. Lyons, I'm concerned about the Administration's request for Accident Tolerant Fuels. These include work on new ceramic cladding for LWR fuel rods that would make hydrogen explosions such as those that happened at Fukushima not occur. The FY15 President's budget request cuts the ATF program in Fuel Cycle R&D by $17M, from $60.1M in FY14.

Congress has yet to receive the Plan it first directed DOE to prepare 2 years ago to understand how DOE intends to demonstrate accident tolerant fuel (ATF) fuel by 2020. My further understanding is that you have said that you would like to be in a position to be able to down-select to one or two approaches by 2016.

It is not clear to me how DOE can be confident that its past expenditure will be adequate to demonstrate the new fuel by 2020. In fact, at the proposed level for FY15, I have heard that it is very unclear that the program will be able to achieve its goal. Why do you think it is reasonable to cut this funding given your plans for 2016 and 2020? When will we receive the report we requested?

Dr. Lyons. The Office of Nuclear Energy's Fuel Cycle Research and Development program was working on advanced fuel concepts prior to the accident at Fukushima. After the accident the program accelerated its efforts and is currently focused assessing the feasibility of accident tolerant fuel concepts.

At the funding level requested for FY 2015 the accident tolerant fuel program will continue on schedule. Multiple multi-year projects were funded with FY 2014 funding. Most notable will be multiyear contracts with industry teams to assist with the feasibility assessments of accident tolerant fuel concepts under consideration. The funding is also being used to increase the capability for performing experiments and post irradiation examinations, and prepare for potential future experimental capabilities such as water loop and transient irradiation experiments.

In FY 2015, we plan to continue our feasibility and assessment activities. This includes bench-scale fuel fabrication and testing, establishing modeling capabilities and evaluating the impacts of accident tolerant fuel concepts.

The FY 2015 request also supports restarting the TREAT reactor at the INL to reestablish a domestic transient testing capability. This capability will enable the NE R&D programs to understand fuel performance phenomenology at the milli-second to second time scales as well as provide a capability to screen advanced fuel concepts, including accident tolerant fuels, which allows for early identification of the limits of fuel performance.

Regarding the report to Congress, the Department is diligently working to finalize and release this report to Congress as soon as possible.

QUESTIONS FROM MR. FLEISCHMANN OF TENNESSEE

HYDROGEN AND FUEL CELL TECHNOLOGY

Mr. Fleischmann. There have been many significant advancements hydrogen and fuel cell technology to the point where industry is starting to bring commercial products to the market for stationary and transportation applications.

Can you describe the progress made to develop these technologies – within EERE and FE, explain how you arrived at the funding levels presented in the budget, and present your views of these programs going forward?

Dr. Danielson. The EERE Hydrogen and Fuel Cell Technologies Program and the Office of Fossil Energy within DOE have made tremendous progress over the last few years. For example, these programs:

- Reduced the projected high-volume manufacturing cost of automotive fuel cells, estimated to be \$55/kW at the end of 2013. This represents a more than 30% reduction since 2008 and a more than 50% reduction since 2006. (EERE)
- Improved the catalyst specific power of fuel cells to 5.8 kW per gram (g) of Platinum Group Metal (PGM) in 2012, which is more than double the 2008 baseline of 2.8 kW/g, and is approaching the 2020 target of 8.0 kW/g; this reflects a more than 80% reduction in total platinum content in fuel cells since 2005. This has been achieved through breakthrough developments such as nanostructured thin film catalysts and core-shell catalysts (in which platinum coats the outside of a non-platinum-containing core). (EERE)
- Reduced the capital cost of electrolyzer stacks by 80% since 2002. (EERE)
- Demonstrated the world's first tri-generation (combined heat, hydrogen, and power) fuel cell station, which has shown a combined efficiency of 54% for co-producing hydrogen and power from a stationary fuel cell. (EERE)
- The program's funding has led to 40 commercial technologies, more than 60 emerging technologies (expected to be commercial within three years) and more than 450 patents. (EERE)
- Reduced by a factor of 10 the projected high-volume manufacturing cost of solid oxide fuel cell (SOFC) stacks to \$225/kW by the end of 2013 (FE)

- Improved SOFC cell power density from ~100 W/cm^2 to more than 500 W/cm^2 (FE)
- Reduced the rate at which SOFC cells degrade by a factor of 10 (FE)
- Increased SOFC stack size (in terms of kW) by a factor of 25 (FE)
- Increased the active area of SOFCs by a factor of 10, to ~1000 cm^2 (FE)
- Demonstrated the world's first pressurized SOFC/gas turbine hybrid power system, producing ~200 kW at an electrical efficiency greater than 50% (FE)

In FY15, EERE intends to continue on these successes by requesting nearly $93 million to support a focused R&D effort to reduce the cost and increase the durability of fuel cell systems, with a targeted cost of $40/kW and durability of 5,000 hours, which is equivalent to 150,000 miles, by 2020. In addition, EERE will invest in R&D for technologies that can bring the cost of hydrogen fuel (delivered and dispensed) from renewable resources to less than $4.00 per gallon of gasoline equivalent–dispensed and untaxed–by 2020. In FY 2015, EERE's Fuel Cell R&D subprogram will emphasize areas such as stack component R&D, systems, and balance of plant (BOP) components. EERE's Hydrogen Fuel R&D subprogram intends to focus on technologies and materials that will reduce hydrogen production, compression, transport, and storage costs. Funding also supports targeted early market fuel cell demonstrations and addresses codes and standards to overcome barriers to commercialization.

The Office of Fossil Energy Advanced Energy System program is requesting $3 million for FY2015 and will focus research and development on the advanced materials component of solid oxide fuel cells. FE's primary emphasis is on the development of high temperature SOFCs fueled by either coal or natural gas for central, large scale (multi-MW) power generation, combined cycles (e.g. gas turbines and fuel cells) and Carbon Capture and Storage (CCS). SOFCs were particularly selected for stationary power generation applications because they yield high electrical efficiency. Additionally, SOFCs can be readily adapted to CCS applications, a major focus under the FE portfolio.

TUESDAY, MARCH 25, 2014.

SCIENCE FY 2015 BUDGET

WITNESS

PATRICIA DEHMER, ACTING DIRECTOR, OFFICE OF SCIENCE, U.S. DEPARTMENT OF ENERGY

Mr. NUNNELEE [presiding]. This hearing will come to order. I am Alan Nunnelee, the vice chair of the subcommittee, and Mr. Simpson is required to be in two places at this moment, so he asked me to go ahead and gavel the committee in, and then he will be here as quickly as he can.

So I welcome our witness, Dr. Pat Dehmer, the Acting Director of the Department of Energy's Office of Science. Dr. Dehmer, this morning the subcommittee heard from the Department's applied energy programs. One of the challenges they continually face from the committee and from Congress is to justify how their programs are able to support this Nation's energy sector without displacing or duplicating work the private sector is or should be doing. It is a question that has no easy answer, but we need to be mindful of staying on the right side of that line.

The challenge you will be facing this afternoon is not an entirely different one: to explain to this subcommittee, populated as it is with nonscientists like me, why investing in your programs is good use of our taxpayer dollars.

Your program has, of course, generally received broad bipartisan support; however, as budgets continue to be constrained, you and your colleagues will have to work even harder to find ways to illustrate the importance of your programs as they compete with others for funding.

This challenge is made even harder because it seems as if the very nature of scientific investment has changed over the last couple of decades. Cutting-edge science is even more reliant than ever before on multibillion-dollar facilities that few, if any, countries are willing to fully support alone. That means investing in the biggest scientific questions of our day relies at least partly on multinational teams. At the same time, it is difficult to justify spending billions of U.S. taxpayer dollars on international efforts abroad while our constituents here at home need jobs and support.

Yet even our domestic facilities, many of which are among the best in the world, face an uncertain future. Realistically, your outyear budgets are more likely flat, if not declining. We have been telling you this for years, yet your budgets are increasingly consumed by operating your existing machines and constructing new ones. I hope we will hear today what you feel to be the correct balance between facility operations and investments on one hand and, on the other hand, investing in the highly trained workforce needed to preserve our country's position leading the international scientific community.

Dr. Dehmer, please ensure that the hearing record questions for the record and any supporting information requested by this subcommittee are delivered in final form to us no later than 4 weeks from the time you receive them.

Members who have additional questions for the record will have until the close of business tomorrow to provide them to the subcommittee office.

With that, we will ask Ranking Member Kaptur for her opening statement.

[The statement of Mr. Simpson follows:]

Chairman Mike Simpson
Subcommittee on Energy and Water Development, and Related Agencies
House Committee on Appropriations
Hearing on the Department of Energy's
Science Account
2:00pm, March 25, 2014
Opening Statement As Prepared

The hearing will come to order.

I'd like to welcome our witness, Dr. Pat Dehmer, Acting Director of the Department of Energy's Office of Science.

Dr. Dehmer, this morning the subcommittee heard from the Department's applied energy programs. One of the challenges they continually face from the Committee and from Congress is to justify how their programs are able to support this nation's energy sector without displacing or duplicating work the private sector is or should be doing. It's a question that has no easy answer, but we need to be mindful of staying on the right side of that line.

The challenge you'll be facing this afternoon is an entirely different one -- to explain to this Subcommittee, populated as it is with non-scientists like myself, why investing in your programs is a good use of taxpayer dollars. Your program has, of course, generally received broad bipartisan support. However, as budgets continue to be constrained, you and your colleagues will have to work even harder to find ways to illustrate the importance of your programs as they compete with others for funding.

This challenge is made even harder because it seems as if the very nature of scientific investment has changed over the last couple of decades. Cutting edge science is more reliant than ever before on multibillion dollar facilities that few, if any, countries are willing to fully support alone. That means investigating the biggest scientific questions of our day relies at least partly on multinational teams. At the same time, it is difficult to justify spending billions of U.S. taxpayer dollars on international efforts abroad when our constituents here at home need jobs and support.

Yet even our domestic facilities, many of which are among the best in the world, face an uncertain future. Realistically, your out-year budgets are most likely flat, if not declining. We've been telling you this for years. Yet, your budgets are increasingly consumed by operating your existing machines and constructing new ones. I hope we'll hear today what you feel to be the correct balance between facility operations and investments on one hand, and on the other hand investing in the highly trained workforce needed to preserve our country's position leading the international scientific community.

Dr. Dehmer, please ensure that the hearing record, questions for the record, and any supporting information requested by the Subcommittee are delivered in final form to us no later than four weeks from the time you receive them. Members who have additional questions for the record will have until close of business tomorrow to provide them to the Subcommittee office.

With that, I'll turn to Ranking Member Kaptur for her opening statement.

#####

Ms. KAPTUR. Thank you, Mr. Chairman, very much, and welcome, Dr. Dehmer. It is really a pleasure to have you with us today. And the Secretary of Energy Dr. Moniz has repeatedly stated his belief in an all-of-the-above strategy for our country that promotes production of domestic energy, creates jobs and opportunities for American families, and addresses the serious issues imposed by climate change. I believe that much of the inspiration to overcome these challenges must come from your Office of Science.

Last week there was an interesting New York Times article that I will ask unanimous consent to insert in the record entitled “Billionaires with Big Ideas Are Privatizing American Science.” And I admire the motivation to give back to society, and we can certainly all use the help in this time of budget austerity; however, I am concerned that this trend points to the fact that the United States Government is failing in an area critical for future economic growth, and that is high science.

Innovation is one of the last frontiers where the United States has and continues to clearly lead. We cannot become complacent believing that these philanthropic-minded citizens are able or will continue to fund the Nation’s needs, or even will figure out the most important arenas in the national interest.

Moreover, innovation outside the public sphere threatens our ability to ensure the work of our best and brightest leads to domestic growth and manufacturing in America’s interests; not just in some subset of us.

Recognizing the budgets that are the current reality, the Department must approach its science portfolio with even more rigor than before, and we know you are. There is evidence of such an effort in this administration’s request, and I hope today you will help the committee understand the trade-offs we are making in the name of scarcity. Our leadership in many areas of science and technology depends in part on the continued availability of the most advanced scientific facilities for our researchers, and as we discussed last year, many of the Department’s infrastructure plans were developed with a far more optimistic funding profile than current reality will support.

Now that you have had several years to reorient your program, I hope today you will take time to discuss both the hard choices made by this budget request and those challenges yet to come under a flat budget scenario. I want to touch briefly on the national labs which are rightly viewed as a national treasure. However, coming from an area without a national lab, as most Members do, I continue to wrestle with how the labs can play a transformational role for organizations beyond their boundaries and help jump-start sectors of our economy that so desperately need their technology, beginning with American manufacturing. I look forward to your insights.

Thank you, Mr. Chairman, for this time, and we look forward to your testimony.

Mr. SIMPSON. Thank you.

Ms. Dehmer, we are looking forward to your testimony.

Ms. DEHMER. Okay, thank you so much. Thank you, Chairman Simpson, Ranking Member Kaptur and members of the committee. I am pleased to come before you today to discuss the President’s fiscal year 2015 budget request for the Office of Science. I first want to thank you all and everyone on the committee for your continued support for the Office of Science, and especially for your support in the 2014 omnibus.

In formulating our budget this year, our decisions were based on several considerations. The first priority is the pursuit of leadership in areas judged to be critical for the U.S. and for the Department of Energy's mission. At the top of this list is high-performance computing.

The Office of Science is on a path to deliver a capable exascale machine by early in the next decade. We expect that in the coming decades, computational modeling and simulation will play an integral and essential role in all facets of science and engineering.

We cannot cede the discoveries afforded by high-performance computing to others, and, indeed, other countries are now aggressively pursuing exascale computing using indigenous components.

Today modeling and simulation already have enabled us to examine subatomic phenomena such as the quark-gluon plasma at the Relativistic Heavy Ion Collider; to develop new materials such as superconductors; and to understand the workings of proteins, the perfect and still largely inscrutable biomolecular machines that power life.

In the world of engineering and manufacturing, today's leadership computing facilities at Argonne and Oak Ridge National Laboratories have modeled neutron transport in reactor cores to predict the behavior of nuclear fuels; have conducted combustion simulations to increase fuel efficiency in vehicles; have made U.S. airplane engines quieter, more fuel efficient, and less polluting; and have simulated ice formation in water drops to reduce the wind turbine downtime in cold climates.

The next generations of computers promise even greater understanding and predictivity, permitting engineering design with confidence and without prototyping; permitting materials design without an experimental laboratory; and permitting the understanding of complex coupled phenomena. So what do I mean by that? That sounds pretty techie. For example, can we predict the flocking patterns of birds, knowing only how a single bird flies? This is a trivial example of perhaps one of the greatest challenges we will put to computers, that of understanding complexity, how the behavior of a system derives from its parts. The U.S. needs to be the first to benefit from the next generation of computers.

Our second priority includes selected increases for research and for instrument and facility construction. Even in constrained budgets, we must move forward with new things, and we are willing to do so. The fiscal year 2015 request includes a new activity in the Basic Energy Sciences program for the development of computer modeling in material sciences. Though a leader in the development of many, if not most, scientific modeling codes, the U.S. researchers still rely on materials modeling codes developed outside the United States. Our researchers must pay to use the codes. They do not have access to the source code, and the codes do not run very well, very efficiently on machines with multiple processors like our Leadership Computing Facilities. This is completely unacceptable in a field as important to innovation as materials design.

The 2015 request also includes increases for ongoing major construction projects such as the Linac Coherent Light Source and the Facility for Rare Isotope Beams. It includes increases for detector upgrades of the Large Hadron Collider and for new buildings or infrastructure upgrades at four of our laboratories.

Our third priority is the optimal operation of our scientific user facilities, which together serve 28,000 users annually. Again, we give priority to those facilities that align with areas judged most critical. Facilities that are operated at 100 percent optimal are the Leadership Computing Facilities and NERSC, and the Basic Energy Sciences X-Ray Light Sources Neutron-Scattering Facilities, and Nanoscale Science Research Centers, which together support materials design, development and characterization.

Finally, our fourth priority is maintaining a balance between research and facilities. Overall, 40 percent of our budget is invested in the support of researchers in academia and in the DOE laboratories. This percentage has been steady for many years, and we commit to continuing this.

Finally, our budget was informed by considerable external advice. Our choices were informed by important advice from the Federal advisory committees and also by the year-long activity to prioritize existing and proposed scientific user facilities. This activity also involved all six of our Federal advisory committees.

In the near future, indeed 2 months from now, at the end of May, we are looking forward to receiving input on the strategic plan for the High Energy Physics program from the High Energy Physics Advisory Panel.

In formulating this budget, we did, indeed, make hard decisions. Overall, we are confident that the budget will advance science, will provide 21st century tools and facilities for our research communities, and will maintain U.S. leadership in key areas important to U.S. competitiveness.

Thank you. I look forward to your questions.

Mr. SIMPSON [presiding]. Thank you.

[The information follows:]

Statement of Patricia Dehmer, Acting Director of the Office of Science

U.S. Department of Energy

Before the

House Committee on Appropriations

Subcommittee on Energy & Water Development

March 25, 2014

Thank you Chairman Simpson, Ranking Member Kaptur, and distinguished members of the Committee. I am pleased to come before you today to discuss the President's FY 2015 Budget Request for the Office of Science in the Department of Energy. As you know, the DOE Office of Science is the Nation's largest source of funding for basic research in the physical sciences. Our research investments in basic science and user facilities are vital to advancing U.S. leadership in science and strengthening our national competiveness. I thank you and this Committee for your ongoing support for our mission. I also want to thank you for your support of the Office of Science in the recent FY 2014 Omnibus, which we are now implementing.

Coordination between the basic research and applied energy technology programs is a high priority for the Department, as demonstrated by the creation of the new Office of the Under Secretary for Science and Energy. Office of Science investments in critical materials and enabling infrastructure such as advanced computational facilities underpin applied R&D and technology development. Coordination between the basic and applied programs is maintained through activities such as joint planning meetings, technical community workshops, joint research solicitations, and focused "tech teams" in targeted research areas. Joint funding of research activities and facilities at the DOE laboratories and funding mechanisms that encourage broad partnerships are additional means to facilitate greater integration of the basic and applied research communities.

This year, in addition to a strong core of basic research, the Office of Science budget request highlights three themes: (1) research for advanced computing, computational sciences, and scientific modeling including the support of data collection and curation for model validation; (2) maintaining and improving the scientific user facilities as well as increasing availability to their users; and (3) construction of new scientific user facilities and urgently needed laboratory buildings and infrastructure.

Advanced Scientific Computing Research (ASCR) supports research to discover, develop, and deploy computational and networking capabilities to analyze, model, simulate, and predict complex phenomena important to DOE. The ASCR budget increases $62.9 million or 13.2% relative to the FY 2014 appropriation.

The request includes increases for research and development, for data-intensive science, and for prototypes in critical technologies such as processors and memory. These investments are necessary steps in the path toward capable exascale computers. Because big data and big computing go hand-in-hand, ASCR is also developing architecture to provide full lifecycle management of facility-generated data—observational, experimental, and simulation. In FY 2015, the request supports the development of a plan for system-wide architectures and for the expansion of demonstration projects to pilot studies to address selected data applications.

The National Energy Research Scientific Computing Center (NERSC) at Lawrence Berkeley National Laboratory (LBNL) and the Leadership Computing Facilities at Argonne and Oak Ridge National Laboratories are funded to operate optimally. This year NERSC will move to its new home in the Computational Research and Theory Building at LBNL. The budget request also includes funding to support preparations for planned 75-200 petaflop upgrades for the Leadership Computing Facilities in the outyears.

This request also supports the initiation of a post-doctoral training program for high-end computing and computational science.

Basic Energy Sciences (BES) supports research to understand, predict, and ultimately control matter and energy at the electronic, atomic, and molecular levels in order to provide the foundations for new energy technologies. The BES budget increases $94.6 million or 5.5% from the FY 2014 appropriation. The request continues support for on-going core research, Energy Frontier Research Centers, and the Energy Innovation Hubs for Fuels from Sunlight and Batteries and Energy Storage.

The request includes a new activity for the development of computer modeling in materials science. This activity will provide the scientific foundation and tools for predictive design of functional materials. Though a leader in the development of many—if not most—scientific modeling codes, U.S. researchers still rely heavily on materials modeling codes developed outside the U.S. The new activity, which supports the Materials Genome Initiative for Global Competitiveness (MGI) that was initiated in June 2011 by the Administration, will significantly improve U.S. modeling capabilities. In order to gauge the accuracy of the models, the activities will be combined with data from the BES facilities for synthesis, processing, and characterization of materials at the atomic and electronic levels

With the level of support requested for facility operations, four light sources, two neutron scattering sources, and five Nanoscale Science Research Centers all operate optimally. The National Synchrotron Light Source–II (NSLS-II) transitions to operations, and the National Synchrotron Light Source ceases operation. NSLS-II will enable scientists to probe the fundamental properties of matter with nanometer-scale resolution and atomic sensitivity, enabling discovery and innovation. With the Spallation Neutron Source (SNS) at Oak Ridge National Laboratory operating at its design specifications and nearly fully instrumented, operations at the Lujan Center will cease. The Spallation Neutron Source is the world's brightest pulsed neutron facility and presently includes 16 instruments that are in high demand in disciplines from biology to condensed matter physics. The SNS will host an estimated 800 users in FY 2015.

Informed by the findings and recommendations of the July 25, 2013, Basic Energy Sciences Advisory Committee report *Future X-ray Light Sources*, the Linac Coherent Light Source-II (LCLS-II) project has been modified to include the addition of a superconducting linear accelerator and new undulators to support a high-repetition-rate free-electron laser. This new x-ray source will solidify the LCLS complex as the world leader in ultrafast x-ray science for decades to come. The Advanced Photon Source (APS) Upgrade MIE project will continue with planning, design, prototyping, and research and development related to implementation of a multi-bend achromat lattice that will achieve major improvements in source brightness and coherence. In addition, the NSLS-II Experimental Tools MIE project will continue with the design, procurements, construction/fabrication, installation, testing, and commissioning of equipment during FY 2015.

Biological and Environmental Research (BER) supports fundamental research and scientific user facilities to achieve a predictive understanding of complex biological, climatic, and environmental systems for a secure and sustainable energy future. The BER budget increases by $18.3 million or 3.0% relative to the FY 2014 appropriation.

The request continues support for research in Genomic Science, Climate and Environmental Science, the three DOE Bioenergy Research Centers, and the three national scientific user facilities—the Atmospheric Radiation Measurement Climate Research Facility (ARM), the Joint Genome Institute, and the Environmental Molecular Sciences Laboratory.

The request includes an increase to support activities that allow the expansion and incorporation of data from the ARM facility in an Earth system model with better than 10 kilometer resolution and improved certainty of prediction. Research includes the development of data assimilation methodologies and new atmospheric parameterizations of cloud, aerosol, and precipitation processes, relevant to scales as small as 10 meter resolution, to address cloud edge processes in high-resolution models. Work will exploit data from each ARM fixed facility and will be a component of each mobile facility deployment—providing unique and specialized testbeds for model improvement and validation based on recent ARM enhancements. The ARM fixed site in the Tropical Western Pacific will be closed in late 2014; instrumentation from this site will be incorporated into the fixed site at the Southern Great Plains to expand the footprint of this site in support of the work just described

Fusion Energy Sciences (FES) supports research to expand the fundamental understanding of matter at very high temperatures and densities and to build the scientific foundation of fusion energy. The FES budget decreases $88.7 million or 17.6% from the FY 2014 appropriation.

The National Spherical Torus Experiment (NSTX) will operate for an 18-week run following its 3-year-long upgrade. The new center stack assembly will enable a doubling of the magnetic field and plasma current and an increase in the plasma pulse length from 1 to 5 seconds, making NSTX the world's highest-performance spherical tokomak. Along with other upgrades, this will support a strong research program to develop the improved understanding of the spherical torus configuration required to establish the physics basis for next-step facilities, broaden scientific understanding of plasma confinement, and maintain U.S. world leadership in spherical torus research.

Following the restoration of Alcator C-Mod funding in the FY 2014 Omnibus, the request provides $18M of funding to support research and operations of a 5-week run for Alcator C-Mod. The DIII-D facility will operate for 15 weeks, a slightly reduced schedule owing to planned upgrades in FY 2015.

Funding is provided for the U.S. Contributions to ITER project to support the U.S. ITER Project Office operations, the U.S. cash contribution to the international ITER Organization, and continued progress on in-kind hardware contributions. These include industrial procurements of central solenoid magnet modules and structures, toroidal field magnet conductor fabrication and diagnostics, and tokomak cooling water system procurement.

In the spring of 2012, in efforts to ensure a responsible budgetary approach while maintaining contributions to the project, the administration agreed to support an annual funding level of no more than $225,000,000 per year beginning in FY 2014. Our present assessment of the international project is that it cannot, under current conditions, meet the most recent schedule put forward by the ITER Organization. The requested level of funding for FY 2015 will ensure that U.S. in-kind contributions maintain U.S. commitment to FY 2015 project needs.

High Energy Physics (HEP) supports research to understand how the universe works at its most fundamental level by discovering the most elementary constituents of matter and energy, probing the interactions among them, and exploring the basic nature of space and time itself. The HEP budget decreases by $52.5 million or 6.6% below the FY 2014 appropriation.

The request supports the first full year of operations of the NOvA detector using the world's most intense neutrino beam generated at Fermi National Accelerator Laboratory; this experiment is a key part of the Intensity Frontier research program. NOvA will yield improved measurements of neutrino mixing and the first results that could provide insight into the neutrino mass hierarchy, as well as the search for CP violation in the neutrino sector. The planned CD-4 (Critical Decision 4, representing project completion) date is November 2014.

The request also supports the Muon to Electron Conversion Experiment (Mu2e) and the Muon g-2 MIE project. These experiments will probe energy scales beyond those achievable at Large Hadron Collider (LHC) through the study of rare processes and precision measurements. U.S. contributions to the Belle II project will be complete in FY 2015. The Belle II detector is located at the Japanese B-factory and will study rare decays and CP violation in the heavy quark systems. The planned CD-2 (baseline of the project) date is 4Q FY 2014. The Long Baseline Neutrino Experiment will continue design work consistent with recommendations of the community planning exercise to be completed in FY 2014. The FY 2015 request increases support for the Large Synoptic Survey Telescope during its second year of fabrication and focuses investments on strategic needs in accelerator stewardship. Research funding decreases in FY 2015 to offset these critical investments.

The High Energy Physics Advisory Committee has formed a Particle Physics Project Prioritization Panel, known as P5, to develop an updated strategic plan for the U.S. that can be executed over a 10 year timescale, in the context of a 20 year global vision for the field. The plan is to include an appropriate balance between small, mid-scale, and large experiments and core research. This important community-based exercise is due to be released in May of 2014, and will inform both the execution of the FY2015 budget as well as our FY2016 request.

Nuclear Physics (NP) supports research to discover, explore, and understand all forms of nuclear matter, including experimental and theoretical research to create, detect, and describe the varied forms of nuclear matter that can exist, including those that are no longer found naturally. The NP budget increases $24.4 million or 4.3% relative to the FY 2014 appropriation.

The request continues to support construction of the Facility for Rare Isotope Beams at Michigan State University, which will provide intense beams of rare isotopes for research in nuclear structure and nuclear astrophysics.

The request supports the operation of the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory for 22 weeks, the same as in FY 2014. The RHIC facility is uniquely flexible, allowing study of colliding nuclei at variable energies spanning the transition to the new state of matter discovered at RHIC. The budget also supports 37 weeks of operation at the Argonne Tandem Linac Accelerator System (ATLAS) facility. ATLAS provides high-quality beams of all the stable elements up to uranium as well as selected beams of short-lived nuclei. Funding for the 12 GeV Continuous Electron Beam Accelerator Facility Upgrade at Thomas Jefferson laboratory decreases as accelerator commissioning is completed in FY 2015 and construction transitions to operations funding.

Science Laboratories Infrastructure (SLI) program supports new buildings and other urgently needed infrastructure improvements at our national laboratories. Funding is requested in FY 2015 to complete construction of the Science and User Support Building at the SLAC National Accelerator Facility. New projects in the FY 2015 request includeimportant infrastructure improvements at Princeton Plasma Physics Laboratory, which are fully funded; and complete design studies for the Materials Design Laboratory at Argonne National Laboratory; the Photon Sciences Laboratory Building at SLAC; and a new Integrative Genomics Building at LBNL.

Mr. SIMPSON. Doctor, could you just out of curiosity tell me what an exascale machine is?

Ms. DEHMER. An exascale machine is a machine that runs at 10 to the 18th operations per second. And so let us see if we can tell you what 10 to the 18 is.

Mr. SIMPSON. That is a lot.

Ms. DEHMER. Okay, it is a lot. So you know what a million is, and you know what a billion is because you deal with those dollar amounts, right?

Mr. SIMPSON. We even deal with trillions.

Ms. DEHMER. That is where I was going. You know what a trillion is because you deal with deficits. So the next one up is 1,000 up from that, and that is a quadrillion. That is a petascale, and we have petascale computers now. And 1,000 up from that is quintillion, and that is exascale. So it is 1 million up from the dollar amounts you are used to dealing with.

Mr. SIMPSON. That is a bunch.

Ms. DEHMER. That is a bunch.

Mr. SIMPSON. That is a pretty fast machine, isn't it?

Ms. DEHMER. Yes, it is. Yes, it is. And the world is in a race to make those.

Mr. SIMPSON. Just out of curiosity, what are the advantages, disadvantages if we do or don't do that?

Ms. DEHMER. Oh——

Mr. SIMPSON. What does that give us the capability to do that we can't do now?

Ms. DEHMER. Yeah. I think I tried to touch on that in the opening statement. It gives us a predictability to look at real-world systems and to model and simulate them without having to prototype them. So, for example, if you are trying to create an engine, if you are Ford Motor Company or GM and you are trying to create an engine, in principle you will be able to start prototyping these what they call in silico using the computer without having to make prototypes. You will be able to understand parts of the world that are inaccessible to you because they are too dangerous, they are too far away, so forth.

So the faster computers get, the closer you can get to simulating the real world without approximations, and that is the power of these computers, and that is why the world is in a race to approach exascale.

Mr. SIMPSON. That is fascinating. Kind of blows your mind.

The Office of Science is one of our bill's top priorities. It obviously drives American innovation, keeps our science and engineering workforce competitive, and leads to tomorrow's jobs in manufacturing and other sectors. In the Department, the Office of Science supports remarkable research, and there are great opportunities that you have mentioned that are out there, but we also face a stark fiscal reality. This year's request proposes to reprioritize funding within the science portfolio by cutting the Fusion and High Energy Physics Programs in favor of Basic Energy Sciences and Nuclear Physics. In these times of fiscal austerity, can you walk us through the difficult trade-offs these programs face in the coming years?

Ms. DEHMER. Sure.

Mr. SIMPSON. Because I don't see our budget getting any better for the next while, frankly.

Ms. DEHMER. Right.

The decrease in High Energy Physics was driven by a couple of factors. One, some of the construction projects were rolling off, and so funding decreased. Second, we are not going forward with major new starts, and the major new start under discussion is the Long-Baseline Neutrino Experiment, until we hear the priorities put forward by the High Energy Physics Advisory Panel. So that is the decision on major increases in the High Energy Physics Program is essentially delayed until we get that advice.

In Fusion Energy Sciences, we want to keep a vigorous domestic program. This year we had a cut in the ITER construction in response to what is happening in the ITER Organization. The administration absolutely maintains its commitment to the joint implementing agreement that was put in place in approximately 2006, but realistically we believe that our request this year will provide the ITER project with what it needs this year.

Mr. SIMPSON. And we, in fusion energy, we cut the ITER by $15 million, and domestic fusion energy research by what, $40 million?

Ms. DEHMER. It is less than that, I believe. I would have to look at the numbers. I don't have them.

Mr. SIMPSON. Overall, it was about 90—$90 million cut on that.

But nevertheless, the fiscal year 2012 bill directed the Department's energy programs to transition away from awarding multiyear grants that mortgage future years' appropriations unless absolutely necessary as in the case for large construction projects that we simply cannot fund in 1 fiscal year. We find tremendous value in fully funding projects up front, particularly small grants, so that we can more adeptly handle the fiscal environment in which we find ourselves in in any given year.

I am happy to report that the bulk of the Department's energy programs made this transition quickly, and now these programs are in a position to react more quickly to changes in funding and market conditions. The Office of Science, however, was never as nimble on this subject. Of the 43 multiyear awards made by the Department's energy programs in the first 2 months of this fiscal year, 41 were made by the Office of Science, or 95 percent of them. And to clarify, these were not large projects. The average total science award was only $952,000. This has been consistent with your office's previous practices. As a result, last year's omnibus appropriations bill included a requirement to fully fund awards and grants less than $1 million. And can you provide us with an update on how that transition to fully fund projects of under $1 million is going?

Ms. DEHMER. We are absolutely following the direction to the letter.

Mr. SIMPSON. Okay. Ms. Kaptur.

Ms. KAPTUR. Thank you, Mr. Chairman, very much.

And thank you for your testimony, Doctor. I was just going over the last page of your testimony where you talk about Science Laboratories Infrastructure, and you talk about funding requested for 2015 to complete construction of Science and User Support Building at the SLAC National Accelerator Facility. Where is that located?

Ms. DEHMER. California.

Ms. KAPTUR. California.

And then it talks about infrastructure at Princeton——

Ms. DEHMER. Yes.

Ms. KAPTUR [continuing]. New Jersey, and completing design studies from materials design at Argonne, an existing laboratory, and then Photon Sciences Lab, again at SLAC, and an Integrative Genomics Building at LBNL.

Ms. DEHMER. Yes, that is the Berkeley lab.

Ms. KAPTUR. Also at Berkeley.

I just wanted to step back for a second and say to you in your position, you know, if you were to overlay the Nation of various academic institutions and how we disburse Federal funds for research, I remember when I was first elected many years ago, and we didn't even have a phone connected on the 6th floor of Longworth, and the first visitor in the office was from MIT, the MIT lobbyist. And I actually studied at MIT, so I appreciate it, but they didn't even know that. They were just there to lobby a freshman. And I thought, my gosh, my university people don't even know what my office number is yet from out in Ohio.

And I guess my request to you is, as I visit these various laboratories, and I look at the infrastructure and the fine minds that are working there, and then I look at the parts of the country that have been economically hurting for a long time, all I would ask you to do is find a way to find the universities in places that aren't the favorite few here in Washington and to do some affirmative effort to find what is there, and to see, whether it is engineering, whether it is math, whether there are ways that with all of the duties you have that you could really look at parts of the country that have major, major challenges, and not all professors in those regions are inadequate. Many are there for various reasons, and they have something to contribute.

But I found, for instance, when I was on the National Science Foundation Committee, it was the same universities all the time. And I just look at the flow of funds over, you know, 25 years, and I think, okay, it is great for the country, but it is not so great for many other regions of the country.

So if there is anything you could do to broaden the umbrella—we are not even asking for buildings; we are just asking for inclusion—and to particularly look at those places in the country that have had serious outwashes of production, and where the people are still struggling to obtain work.

The role of these incredible institutions can really make a difference, and we have had really good—made some good efforts in our area to sign an agreement with Argonne, for example, with a NASA facility, which is the only Federal research facility we have in northern Ohio.

But I just look around the country, and I think, you know, it is a good life working at Berkeley. Man, you look out over the Pacific, you know, and fog comes in, and the sun comes up, and places for lunch, and comfortable. And, you know, everybody has got an IQ above, what, 120, 150—2,000, probably. And I just look at the places in the country. Our chairman of the full committee comes from Kentucky. I look at some of the struggles that he has in Kentucky, and I think in the high sciences they ought to at least be surveying the horizon and taking jewels that exist in different parts of the country, including them.

I remember when I was on one of the veterans subcommittees and I said, you know, you have got a problem with all of these veterans who are sick in the beds every day in these hospitals, and let us take a look at who is on your protocols, which scientists are coming in to make decisions about where to give grants for this or that within the VA. It was the same thing.

So I see a Federal pattern across different departments, and I am just trying to sensitize you to my concern that there be inclusion, and that somebody be thinking about that somewhere in your shop and at least provide opportunities to include people on peer review panels, places that the Department of Labor can tell you exactly where these communities are, and there are whole regions that lack the kind of capacity that many of these facilities that you have mentioned in your testimony have.

So I just wanted to make that point. I just want to go to my questions here. I wanted to ask you a question about other countries, and when you talk about everybody wanting to get into certain types of high science. In the way you look at the world, how would you rank those countries and in which areas of inquiry?

Ms. DEHMER. Okay. Let me back up a little bit. When I started in science, it was a very long time ago, probably 40 years ago, the United States was the place to be. The United States has not diminished at all. We still have outstanding researchers who are well funded. The change has been that other countries, other areas of the world recognize that science and engineering are incredibly important for their economic development.

So now I would say that, for example, in high-performance computing, big competitors are in China— China actually has the number one top-performing computer right now; in Japan and in Europe.

In light sources, light sources are incredibly important because they can examine materials at the atomic level. And if you know how materials are made at the atomic level, you can start building new ones. We were dominant. The United States was dominant in light sources for decades, and I know because I used some of the early ones in the early days of light sources in the 1980s. Today China, Japan, Europe, South America are all building light sources that are competitive with ours. It is not that we aren't well funded, and building outstanding machines, and having outstanding people work; it is that the rest of the world has figured out that they have to do this, too.

And so we are in a race in the important technological areas that drive innovation with other parts of the world.

Ms. KAPTUR. Where is Russia?

Ms. DEHMER. Russia is not at the same level in computing. It is not at the same level in materials characterization using these very advanced tools, but they have some outstanding researchers, and they have outstanding facilities for particle physics and high-energy physics. Novosibirsk is one that comes to mind.

Ms. KAPTUR. You have talked about material science.

Ms. DEHMER. Yes.

Ms. KAPTUR. And we know that that is critical for the advancement of our Nation's manufacturing base. Can you take a few moments to delve a bit more into what the Office of Science is doing in the area of material science?

Ms. DEHMER. We have one of the biggest material science programs, basic research material science programs, in the government. And I think taken as a whole, the Department of Energy is probably the lead in material sciences if you include the technology offices.

What we have done over the past decade is we have worked very hard to understand how materials are constructed from the bottom up using nanoscale science. We built five nanoscale science research centers in the mid–2000s, and what we are doing now is trying to develop new materials with new properties and new functionality that can actually be put into production for things like batteries, and solar cells, and catalysts, and so forth. So we are one of the leads in material sciences, and we are very aggressive about pursuing new ways of doing business.

Ms. KAPTUR. Does that include metals as well as composites?

Ms. DEHMER. Absolutely. Metals, alloys, composites, soft material, everything.

Ms. KAPTUR. All right. That is my first round, Mr. Chairman.

Mr. SIMPSON. Mr. Nunnelee.

Mr. NUNNELEE. Thank you, Mr. Chairman.

Well, this is the second time today that the ranking member and I are so much along the same line of questioning that I think we must be working off the same notes.

To be honest, while I do consider her a friend and respected member of this committee, I think it is more indicative of the bipartisan nature of the work on this committee, because the issues that we are confronting really don't know partisan boundaries.

In my opinion, we are standing on the shoulders today of the people who came before us that made the decision to invest in research and those who actually conducted that research. And almost every aspect of every one of our daily lives has been impacted by the work they did before we got here. I am thinking I have friends who work every day in careers that once did not exist—In fact, there was not even terminology for these careers when my grandparents were my age. And with that foundation, I look forward to knowing that my children, my grandchildren, and their grandchildren are going to be impacted every day in their life by decisions that we make collectively on this committee by projects that we either embrace or projects that we reject. That is a heavy responsibility.

With that in mind, following on what the ranking member had to say, I would just like you to continue to put in context our Nation's investment in research as compared to that investment being done by other global powers. Where do we fit?

Ms. DEHMER. Perhaps an example. Some years ago when I was still the director of the Basic Energy Sciences Program we made the decision to invest in the Linac Coherent Light Source, which is an X-ray free-electron laser. It was throwing long. No one, no one believed that an X-ray free-electron laser would work, but we used the SLAC Linac, and it turns out that the day of commissioning, many people said it will never work; it will take 6 months to commission. It commissioned in 2 hours.

But that is not the real point of the story. The real point of the story is that Germany was also heavily invested in free-electron lasers, and one of the things that we did was have collaborations with our German colleagues, and they had very advanced instrumentation and detectors. And had it not been for their bringing their instrumentation and detectors over, we never would have made such a huge impact on day one of the commissioning of the Linac Coherent Light Source.

If you go back, say, 20 years, we never could have said that story. There never would have been a Germany that was equal to us and in competition with us at that level. That is becoming more and more true. And I think it is necessary to pick areas of science where the United States wants to be number one and make aggressive investments.

Mr. SIMPSON. Will the gentleman yield for 1 second?

Mr. NUNNELEE. Sure.

Mr. SIMPSON. What does that mean? Not the last statement, but the light source that you are talking about. I mean, practical terms to the American people, the average individual, what does——

Ms. DEHMER. So what do light sources do? Okay, they examine materials at very high resolution through something called scattering, and they can tell you the atomic composition and the placement of atoms in materials. For example, biomolecules, right? Biomolecules are very important, and drug manufacturers are very keen to know the structure of proteins because they can then make drugs that bind to the proteins, right? So the Linac Coherent Light Source is different than conventional light sources. Conventional light sources need tiny crystals in order to do X-ray scattering and get structures of proteins. The Linac Coherent Light Source actually is so bright and so powerful that you can drop a protein, not in a crystal, but you can drop a protein in a little jet of water down in front of the beam, and without a crystal, one molecule at a time, you can begin to get structures.

Now, why is that important? Why is it important to do that fast? It is important to do that fast, because many, many proteins, the majority of the proteins, won't crystallize. So now you suddenly have a tool that does single-molecule imaging—that was one of the stretch goals of this machine—single-molecule imaging of proteins that don't crystallize, and so it opens up a whole new world of science for the users.

Mr. NUNNELEE. All right. You talked about collaboration with other countries.

Ms. DEHMER. Yes.

Mr. NUNNELEE. So much of what we do does require that collaboration.

Ms. DEHMER. Right.

Mr. NUNNELEE. How do we achieve that and at the same time maintain our country's global position, scientific leadership, and our own national interest?

Ms. DEHMER. Well, there are cases where collaboration is necessary and is good; where an instrument is too expensive, too technologically difficult for a single country to build. And the one that comes to mind is the Large Hadron Collider at CERN. We are essentially out of the business in the United States of collider physics, high-energy collider physics, but its perfectly acceptable to us and to the rest of the world to be users at CERN. In fact, a third of the users at the Large Hadron Collider are U.S.

So, okay, but do you want to do that? Do you want to have a central facility in the world that does high-performance computing with you not having access to it or control of it? As far as I am concerned, I don't think so, and that is reflected in our budget. Do you want to have facilities for materials characterization which drives new materials discovery and development that is somewhere other than here? I really don't think so.

So there are places where you collaborate, and there are places where you have to have your own tools. That is how I look at it.

Mr. NUNNELEE. Mr. Chairman, four semesters of calculus got me out of the engineering school and into the business school, but this fascinates me.

Mr. SIMPSON. I agree with the gentleman. This is fascinating stuff, and fortunately, or unfortunately, it is way above my pay level, it is up there, but it is interesting. And that is why I ask on the practical level, how do I explain some of this stuff to the average Joe that wonders why we invest in this stuff? So I appreciate your answers.

Mr. Fortenberry.

Mr. FORTENBERRY. Thank you, Mr. Chairman, and thank you for welcoming me to the committee.

Doctor, I have some particular concerns I would like to ask you. I assume in nuclear experiments that chaos is not a good thing. And yet I have delved a little bit into this ITER facility, the international organization that runs this ITER facility, and it appears to be pretty chaotic. And I think that that is affirmed by the budget request which is lower for Fusion Energy Sciences. And in one particular sentence that you have in your testimony, it says, our present assessment of the international project is that it cannot under current conditions meet the most recent schedule put forward by the ITER Organization.

Is this a waste of money?

Ms. DEHMER. No. That is not our position. You know, as I said at the beginning, the United States, the administration, maintains its commitment to the agreements that we made in 2006, the joint implementing agreement. I have built a lot of projects in my years in the Department of Energy. I spent 12 years as the Director of Basic Energy Sciences, building very large projects, the Spallation Neutron Source and several others, and I know that projects run into trouble. And the management assessor's report on ITER has indicated that ITER is now in one of those periods.

What we expect is for the ITER Organization to accept the recommendations of the management assessor's report, to create a corrective action plan, and to begin to implement that corrective action plan, and at that point I think it is possible for this project to turn around and build ITER. But at this point the $150 million request is what we believe is an appropriate request for this project at this moment in time.

Mr. FORTENBERRY. I am sorry if I am confused about the number. I am reading $225 million.

Ms. DEHMER. No, that was——

Mr. FORTENBERRY. This year's implemented number?

Ms. DEHMER. In 2014?

Mr. FORTENBERRY. Yes.

Ms. DEHMER. In 2014 the number is $200 million.

Mr. FORTENBERRY. And it will drop to $150?

Ms. DEHMER. Correct.

Mr. FORTENBERRY. Okay. I guess the point, then, is affirmed that here we are lowering our commitment because we are basically suggesting that the organization, this organizational structure and the trajectory towards some outcome here appears less and less probable.

Is this money better invested elsewhere? Should this be revisited? This is a lot of money.

Ms. DEHMER. This is a lot of money. I think this year, under these circumstances, $150 million is the correct request.

Mr. FORTENBERRY. Okay. Are we putting a Band-Aid over something that is bleeding, and then next year we will have another consideration as to whether or not we are going to be a part of this at all? And when is the projected project conclusion; 2024, did I read that correctly in another article?

Ms. DEHMER. I don't know what article you are referring to, but the ITER Organization has committed to provide a baseline which is the schedule for the project by summer of next year, by summer of 2015. I don't particularly want to preclude, you know, obviate their work by suggesting what an end date might be for first plasma.

Mr. FORTENBERRY. Okay, then that is when it gets hard for decisionmakers, because we are committed to something that appears to be open-ended, is not going well at the moment. There is no defined outcome. I recognize this is experimental in nature, and it has got international ramifications.

When did this start, and when were the initial assessments that we would actually have some conclusive data or project that was usable, implementable, because it was a lot earlier than this?

Ms. DEHMER. I am sorry, I don't understand the question. When did——

Mr. FORTENBERRY. When did the organization start, and when were the initial timelines and projections for outcomes?

Ms. DEHMER. The ITER Organization became an organization in 2007. And the——

Mr. FORTENBERRY. But the idea was much earlier than that.

Ms. DEHMER. Oh, yes.

Mr. FORTENBERRY. And I assume money spent on it much earlier than this.

Ms. DEHMER. We rejoined, the United States rejoined the ITER Organization at that time. We had been in it much earlier.

Mr. FORTENBERRY. And then suspended our membership. And why did we do that?

Ms. DEHMER. I am not a historian in this particular case, but I believe because of the—you know, the design and schedule.

Mr. FORTENBERRY. So we are bumping maybe perhaps into the same problem here?

Ms. DEHMER. I think it is a very different project at this moment in time than it was at the time we got——

Mr. FORTENBERRY. What is it going to produce and when?

Ms. DEHMER. It is going to produce ITER, which is the first worldwide experiment to create a burning plasma, and probably the earliest—my personal guess, not an administration guess—is late 2023.

But again, the ITER Organization has committed to provide us with a baseline by summer of next year.

Mr. FORTENBERRY. Do we have some sort of probability assessment of what a 2023 outcome is going to look like?

Ms. DEHMER. No.

Mr. FORTENBERRY. And then how much money will we project to have spent by then on this?

Ms. DEHMER. So last year when we submitted the 2014 budget, we said that we would spend up to $225 million a year, up to $2.4 billion, but we would reassess as we approach first plasma.

Mr. FORTENBERRY. Who are the largest contributors to this?

Ms. DEHMER. The E.U. is the largest contributor.

Mr. FORTENBERRY. And how much have they contributed?

Ms. DEHMER. They have 45 percent of the project, and the other members have 9.09 percent each.

Mr. FORTENBERRY. So we contribute 9 percent to the total?

Ms. DEHMER. Correct.

Mr. FORTENBERRY. All right. Thank you, Mr. Chairman.

Mr. SIMPSON. Let me ask you, when these large international joint ventures, I guess you will call them, whether it is the accelerator at CERN or ITER, are they proprietary, the people that do the research there, or is it shared with all of the members?

Ms. DEHMER. No, at CERN the work is not proprietary. The expectation is that the researchers will publish their work.

Mr. SIMPSON. And will that be the same at ITER?

Ms. DEHMER. I would have to go back and look at the ITER agreement. I don't know the answer to that.

Mr. SIMPSON. Is it generally the standard that we use on these types of the facilities?

Ms. DEHMER. Yes, sure.

Mr. SIMPSON. If it is proprietary work, they end up having to pay for it?

Ms. DEHMER. Yes. For virtually all of our scientific user facilities, there is no cost for nonproprietary work, and the expectation is that the researchers will publish their work. A very small fraction, very small fraction, a few percent of the work is proprietary, and then the user pays full cost recovery.

Mr. SIMPSON. Okay. Several years ago the Department of Energy transitioned all isotope-production programs to the Office of Science, a transition that was ordered by Congress a number of years prior to that. In your view is the isotope program operating well under the Office of Science, and is the Office of Science working to ensure that commercial isotope producers have direct working relationships with user facilities on a day-to-day operational matter as it continues its effort to coordinate isotope-production activities across the DOE complex?

Ms. DEHMER. Yes, we think it is working well. There is an isotope office at Oak Ridge National Laboratory, and that is the day-to-day contact for most people who would interact with the program, but others do interact directly with headquarters.

Mr. SIMPSON. The office is authorized to charge its customers fees to recover its costs on the isotope program.

Ms. DEHMER. Yes.

Mr. SIMPSON. And I am told that it also imposes an additional surcharge on all or most customers, which the office says is to pay for infrastructure across all isotope facilities.

Do you believe the pricing, including the surcharges, is well justified and fair to both the taxpayer and the isotope customer?

Ms. DEHMER. I am not familiar with the surcharge. I will have to provide an answer for the record on that.

Mr. SIMPSON. Okay. And I apologize, Mr. Fleischmann. You came back in, and I was thinking we were going right down the line, and—time is yours.

Mr. FLEISCHMANN. Well, thank you. I appreciate the line of questioning from the chairman, and I thank you for this opportunity.

And, Doctor, the sentiments of this subcommittee, I think are very clear. We are truly amazed with what is going on in your field. I have the great privilege of representing the city of Oak Ridge. Any time I go to the lab and see Dr. Mason, I am just amazed with the tremendous strides that we are making across the board in science. It is so important.

I have a few questions, though. The Spallation Neutron Source and HFIR at Oak Ridge National Laboratory make Oak Ridge the world leader when it comes to neutron science, neutron-scattering materials for study, and the production of isotopes and irradiated materials with neutrons. Does the budget request adequately support a continued infrastructure—support the continued infrastructure needs of the neutron facilities at Oak Ridge?

Ms. DEHMER. Yes, it does.

Mr. FLEISCHMANN. Okay, thank you.

Do you foresee an increased role for the neutron facilities at Oak Ridge, especially in light of the closure of the Lujan Center at Los Alamos?

Ms. DEHMER. Yes. The budget that we provided for High Flux Isotope Reactor and Spallation Neutron Source will allow them to accommodate a couple hundred more users, and that is roughly the number of users that will be displaced at the Lujan Center.

Mr. FLEISCHMANN. Okay. Doctor, as you are no doubt aware, the Oak Ridge National Lab is required to maintain an increased security footprint due to the presence of U–233, a fissile material, in building 3019. Although the removal of U–233 from the building 3019 is primarily the responsibility of the Environmental Management, security is the responsibility of the Office of Science.

How much does the Office of Science expect to spend to keep building 3019 secure until the materials are removed?

Ms. DEHMER. I will have to get that answer for you.

Mr. FLEISCHMANN. Okay. If you would provide that for us, I would appreciate that.

Ms. DEHMER. Certainly.

Mr. FLEISCHMANN. A follow-up to that, I know there have been some issues with the removal of U–233 to the Nevada test site. Can you tell the committee about some of the issues encountered and provide with us an updated timeline, please?

Ms. DEHMER. I know that the Department of Energy is working with the State of Nevada to try and reconcile this. I don't know what the timeline is for an outcome of that.

Mr. FLEISCHMANN. Okay. We discussed earlier and I appreciate your going into some of the supercomputing issues, which are tremendous. I wanted to talk with you about that. As you are no doubt aware, Titan at Oak Ridge was the fastest computer in the world until recently being eclipsed by a Chinese computer.

Ms. DEHMER. Yes.

Mr. FLEISCHMANN. Could you please tell us what the Department's plan is in order to remain a world leader in supercomputing?

Ms. DEHMER. Well, I talked a little bit in the oral statement about exascale. We have a plan to produce an exascale machine by the early 2020s that will be 500 to 1,000 times more powerful than the ones we have today.

Moreover, it will be a capable exascale machine is the wording that we use, and what that means is it will be programmable, and it will be usable by the scientific communities. That is a big difference between building an exascale machine that just runs at exaflops per second.

So our goal is to make an exascale machine that is programmable, that has reasonable power requirements, and that is made from commercial components. And we have two or three generations of computers that will be installed at Oak Ridge in the intervening years before we get to, say, 2022, 2023. So we are aggressively going forward with that. It is our highest priority in the Office of Science to make that happen.

Mr. FLEISCHMANN. Thank you very much. I think you and I agree that supercomputing is a superpriority for our Nation.

Ms. DEHMER. It is.

Mr. FLEISCHMANN. And I appreciate your passion for that.

If I may in my last question, again, you have touched on it earlier, can you please tell the committee and reemphasize just how important this is with supercomputing to enhance and improve other programs within the Office of Science?

Ms. DEHMER. One of the things that our Advanced Scientific Computing Research Program does is it reaches out to all of the programs in the Office of Science on a regular basis; has joint workshops to find out what those programs need in terms of capability, hardware capability; and also works with every one of the programs in the Office of Science to advance their scientific computing needs.

In addition, that program has reached out to the technology offices that you talked with this morning, and is working with them as well.

Mr. FLEISCHMANN. Thank you, Doctor.

Chairman, I yield back.

Mr. SIMPSON. Thank you.

I guess the reason people like Mr. Nunnelee and I find this all so fascinating is you are sitting here talking about these supercomputers. I can still remember when I was taking college chemistry and physics classes when I bought my first HP computer that added, subtracted, multiplied, and divided. And the thing is you would use it taking a test, but you didn't trust it. So you would do it with pencil, you know. And that is what is so stunning to us when we see all of this stuff.

I should have said this earlier, and welcome, Mr. Fortenberry, to our subcommittee. It is good to have you on the subcommittee, the Congressman from Nebraska, First District, and we are glad you are with us here.

Mr. FORTENBERRY. Thank you.

Mr. SIMPSON. Ms. Kaptur.

Ms. KAPTUR. Thank you, Mr. Chairman.

I wanted to, Dr. Dehmer, go to the area of bioenergy a little bit, and the Department is currently supporting three Bioenergy Research Centers, and they are in their second 5-year term.

Ms. DEHMER. Yes.

Ms. KAPTUR. And my question really is can you bring us up to date on the progress in those three centers, where are they located, and what breakthroughs have you accomplished during that time, and how do you work with the Department of Agriculture? I can assure you that I was on the Agriculture Subcommittee, and Senator Harkin and I wrote the first title to push the Department of Agriculture into energy, and they didn't want to go there. And we did it in an appropriation bill as the authorizers, so it is really interesting to see where the momentum is.

Now some have discovered that, oh, gosh, there is a future in unlocking the carbohydrate molecule. But my senses were at the beginning of that science, so this morning I put an article in the record dealing with an F–16 unit in our region that flew, the first one, using a blend of canola and other petro blends, and it didn't crash.

But I am interested in, what can you tell us about those three centers? Where are they located? Where are you headed with all of that? What are some of the breakthroughs you have noted, and how do you work with the Department of Agriculture?

Ms. DEHMER. So first the centers are located at Oak Ridge National Laboratory. They have multiple partners. Each center has a number of partners, but the lead institution for the first one is Oak Ridge National Laboratory. For the second one is the University of Wisconsin, and for the third one is Lawrence Berkeley National Laboratory. And like I said, each one of these——

Ms. KAPTUR. The third was Lawrence?

Ms. DEHMER. Lawrence Berkeley National Laboratory.

Each one of these has probably 10 or 15 partners, universities, you know, local industries, whatever.

The Bioenergy Research Centers were established in 2007, and they were established to produce ethanol from cellulose. At the time cellulosic ethanol was a stretch. Most ethanol was produced from crops, food crops, that assembled the raw material into a part of the plant that was easily obtained; corn, for example, corn kernels, or soybeans. Cellulosic ethanol is very different because the feedstock cellulose is entwined inside the woody stems of the plant, and it is hard to get out. It is not a food crop, so it doesn't compete with food crops.

So there were three challenges for the Bioenergy Research Centers when they were started. One is to look at feedstocks, alternate plants. The second was what we call recalcitrance, and that is the process of getting the cellulose out of the plant. The plant doesn't want to give up the cellulose. The plants have woody stalks that are very stiff, and Mother Nature made them that way so they wouldn't fall down, and now we are trying to get the cellulose out of those woody plants. And the third challenge was microbial synthesis of biofuels, mostly ethanol, but it could be higher alcohols or fuels as well.

So each center picked certain areas to emphasize. In a sense, all of the centers touch on each one of these, but in the area of feedstocks, there has been a tremendous effort to look at wild-type feedstocks, for example, looking at thousands of poplar varieties, looking at all kinds of grasses, so just looking at what Mother Nature gives us, but second, doing genetic engineering to make those plants have more cellulose and make the plants release their cellulose easier. So that is the first feedstocks.

The second is recalcitrance, so how do we get the cellulose out of a woody plant? And there were pretreatment innovations made. There was microbial decomposition of plants to get the cellulose out. So in each one of these three areas, there has been major advances made.

And the final is microbial synthesis of fuels, and a couple of the Bioenergy Research Centers have worked very hard to modify microbes to make fuels in a single step, or make heavier fuels. So I think the first 5 years of these Bioenergy Research Centers have been incredibly successful in addressing the three main goals of the BRCs, the Bioenergy Research Centers, when they were formed. Now they are into their second 5-year period with even more ambitious goals, but, again, along these same three areas.

Ms. KAPTUR. But cellulosic has undergirded—it is your fundamental material, from what you are saying?

Ms. DEHMER. Yes.

Ms. KAPTUR. You focused on the alcohol side. What about the oil side?

Ms. KAPTUR. So the Bioenergy Research Centers have also worked on modifying plants to produce oil so that the oils would be easier to extract, but in general, their goal was not to make plants that have oil that could be immediately chemically altered to be alcohols.

Ms. KAPTUR. And is that because that is more expensive?

Ms. DEHMER. I don't know. I don't know the answer to that, but I do know that the fundamental goal of these centers was to use nonfood crops that could be grown in weaker soils so that they wouldn't compete with the soils that we use for food crops, and make it—modify the plants, modify the microbes, modify pretreatment conditions to make it easier to pull the cellulose out of the plants, and then to modify that to make sugars, and then to ferment the sugars.

Ms. KAPTUR. It would be really interesting to look at the sugar versus the oil. I don't know if you can find somebody there who thinks about that.

Ms. DEHMER. I can certainly have a little short white paper, you know, a page or two white paper written on using oils versus using sugars to produce alcohols——

Ms. KAPTUR. Right.

Ms. DEHMER [continuing]. Versus using cellulose.

Ms. KAPTUR. I have a listing in my office one of my seed dealers gave me with all of the oil content of seeds, and some of them are not really edible seeds, but they produce a lot of oil. And so I was just curious for our biodiesel market, for example, how much research is going on there. I am trying to get a sense of what is happening on the sugar side and what is happening on the oil side. So any clarification you can provide would be most interesting.

Ms. DEHMER. Okay. Okay.

Ms. KAPTUR. And I wanted to ask a question I asked this morning of our witnesses from the Department, and that is that of everything you have seen in developing research, for the record, are there any particular fields that, when you have seen what is happening, it has been particularly rewarding for you as a scientist, say, that is really going to mature quickly and is going to make a huge difference? It sounds like supercomputing is where you put a lot of your marbles, but maybe there is something else.

Ms. DEHMER. I think when I look back on my time in the Department of Energy, one of the things I am proudest of is 5 years of workshops with community input and advice from the advisory committee that eventually led to 46 Energy Frontier Research Centers. They are just little engines of discovery.

We recently had the Secretary of Energy's Advisory Board, SEAB, look at the Bioenergy Research Centers, the Energy Frontier Research Centers, the hubs, and the draft report was just posted on the Web, and the Energy Frontier Research Centers have fared extremely well. So I am very proud of that.

In terms of my later years here, I think one of the biggest surprises to come out of the research that is done in the Department of Energy was the Nobel Prize to Saul Perlmutter a few years back for his discovery of the accelerating universe. It is rare in science that a single—a single discovery or a single event changes the way we think about the world around us, and this discovery of the accelerating universe did that. So that is a key point.

The other thing, the third thing, that I would like to mention has to do with our light sources. Every 3 years the Nobel Prize in chemistry is awarded to biochemistry, and the last four prizes in this area were awarded to investigators who used the light sources to learn the protein structures of extremely important proteins. And I think it is remarkable that we haven't missed a Nobel Prize using a light source in four of those, in a set of four of those.

So I think, you know, these are the kinds of things that I think of when I think about what has really changed the way people think.

Ms. KAPTUR. That perspective is most interesting. Thank you for sharing it.

Thank you, Mr. Chairman.

Mr. SIMPSON. Mr. Nunnelee.

Mr. NUNNELEE. Thank you, Mr. Chairman. You and I both have been reflecting on our university career.

Ms. Dehmer, if you would walk me through the relationship between the Office of Science, the various research universities—we have four in my State—and the national labs. How do you integrate them? How do they fit together? And what are their roles? What is your role?

Ms. DEHMER. So in the Office of Science, we support about 300 institutions, and because there are only 17 labs, most of those institutions are universities.

Increasingly, over the last several years, the laboratories and the universities have partnered in big activities. The Bioenergy Research Centers is one. All three of them have university partners, and two of them are run by labs, but have significant university partners.

Of the Energy Frontier Research Centers, three-quarters of them are hosted by universities, and they will reach out to labs and have lab partners.

So what I have seen happen is over the last 10 years that the university community and the laboratory community have become much more interactive, much more collaborative. The labs have been more collaborative with one another. And the university community has relied on the laboratories for its big tools.

Twenty-five, thirty years ago—so I go back with the labs a long ways—there was no such thing as a scientific user facility that was wide open. Today the scientific user facilities have redefined what a laboratory is. We touch as many people by funding them directly as we do by those going to our scientific user facilities at the labs, roughly 28- to 30,000 each. So the labs and the universities have really become partners, each doing what it does best and each needing the other.

Mr. NUNNELEE. So how do you go about deciding whether we need this university to partner with this lab as opposed to that university?

Ms. DEHMER. Typically it is done by a funding opportunity announcement, and the partnering is self-partnering.

Mr. NUNNELEE. So there is an announcement, the universities know about it, and then they just work——

Ms. DEHMER. Typically groups at universities and laboratories will reach out to one another to form a partnership. It is not directed by headquarters.

Mr. NUNNELEE. All right. Thank you.

Yield back, Mr. Chairman.

Mr. SIMPSON. Mr. Fortenberry.

Mr. FORTENBERRY. Thank you, Mr. Chairman.

I want to return to some of what my colleague Ms. Kaptur was talking about regarding biofuels research and ask you to point to some specific outcomes.

And then I do have a concern of trying to get an understanding of what research is going on across multiple disciplines.

For instance, when I was on the Agricultural Committee, we had asked for a summary of all of the research going on across the government into renewable biofuels, and we don't think we ever got it, because it looked like to be a pretty complicated piece of information to try to obtain. So that suggests there might be some duplication going on. Is there a coordinated effort here with the Department of Agriculture?

And then could you be specific in terms of what we are looking at producing? I understand that the next generation of ethanol was to be cellulosic, and there is some advancements being made internationally. It is my impression is we are lagging, though, here in the United States in that regard.

And then regarding your microbial synthesis of fuels, does that mean algae?

Ms. DEHMER. No, it does not mean algae.

Mr. FORTENBERRY. Okay. Well, tell me what that means.

Ms. DEHMER. The Bioenergy Research Centers in general do not work on algae. They work on other kinds of feedstocks. So it would be other feedstocks using microbes to generate alcohols directly.

I don't know enough about this to be as informed as I am on some other subjects.

Mr. FORTENBERRY. Well, I think that is part of my question, and neither do I. And I would like to know what the government is doing everywhere, not just right here, in this regard to ensure that we are coordinating properly, that we have not unproductively stovepiped this between you, the Department of Agriculture, and the Department of Defense, all of whom have interest in this.

Ms. DEHMER. Well, I know that there are coordinating committees, Federal coordinating committees, that do look at this. I also know that the former Director of Biological and Environmental Research, she retired not very long ago, came from the U.S. Department of Agriculture. And so she reached out very often to USDA to form collaborations.

In general, in the Department of Energy, in the Office of Science, we have a good understanding of what our counterparts are doing, whether it be USDA, the National Science Foundation, the National Institutes of Health, or the DOD agencies.

We have a good understanding, and I have not seen an example where partnering doesn't happen when it ought to happen.

I am happy to get you the information on biofuels across the government to give you a sense of where the Department of Energy fits and where other agencies fit.

Mr. FORTENBERRY. That would be helpful, because—to not only understand who is doing what and then who is making the decision about who is going to collaborate with whom. That would also be helpful.

Ms. DEHMER. Okay.

Mr. FORTENBERRY. I think that way we ensure that the proper specialization is supported, and we are clearly always looking for areas in which we can consolidate or make things more effective and efficient.

But in terms of the outcomes, is my statement correct that we are lagging in cellulosic—the next generation of cellulosic production, whereas there are some other countries who have integrated this more successfully into commercial outcomes?

Ms. DEHMER. I don't know the answer to that, but I will get you the answer.

Mr. FORTENBERRY. It is my understanding that China may be as—and I'm going off memory here—but Brazil, I think, has made some advances as well.

Ms. DEHMER. Okay. Again, I don't know. Brazil, of course, is very heavy into sugar.

Mr. FORTENBERRY. Right. Right.

All right. Thank you, Mr. Chairman.

Mr. SIMPSON. Last thing I want to touch on with you is that Congress funded the first three energy innovation hubs in fiscal year 2010. The Committee funded a limited number of these hubs because of their potential to deliver more per taxpayer dollar, but we also funded them with the understanding that the progress must be tracked closely, and that only hubs demonstrating exceptional results should be extended beyond their initial 5 years.

One of the three hubs, the Joint Center for Artificial Photosynthesis at Cal Tech and Lawrence Berkeley National Lab, is under your purview. In laymen's terms, this hub aims to create a device that creates transportation fuels from sunlight. The budget request includes funding to renew the hub for another 5-year term.

How has this hub performed so far, and will you look to recompete it or simply renew it?

While hubs are originally pitched by the Secretary of Energy as initiatives under one roof, this hub is actually under two roofs, Cal Tech and Lawrence Berkeley Laboratory. Is that model proving effective? And what are its challenges? And what have you learned from the hub model of this experience?

Ms. DEHMER. This particular hub has produced to date some very interesting results, one of which was the development of very high-throughput screening for parts of what will become the artificial photosynthetic device. It has developed apparatus for screening tens of thousands of catalysts, for photoabsorbers and so forth quickly and rapidly, and that is a big step in creating a device. And they have also done some very excellent work at the beginnings of trying to assemble components into a device.

This hub, as probably you are aware, had some management challenges in the middle of its life. The Basic Energy Science Program, which runs the hub, which oversees the hub, is going in for the final annual review of the hub in April of this year. Based on that review, guidance will be provided to the hub director, and that guidance can span a wide array.

I can tell you that the likelihood of recompetition is extremely small, because starting a new hub in the same area, we would have to go through the same growing pains. I mentioned earlier the Secretary of Energy's Advisory Board review of hubs, Energy Frontier Research Centers, Bioenergy Research Centers, and NRBE, that report is in draft on the SEAB Web site. It just came out this weekend.

One of the comments that it makes about hubs is that when the renewal time comes, the options should be, for example—I may not get this totally correct—termination, full funding, or something in between. And——

Mr. SIMPSON. That leaves it pretty wide open.

Ms. DEHMER. But recompetition is not one of the options. Recompetition is not one of the options.

The hub owner can also put out less funding, as we have seen with the hub, the buildings hub, and dehubify it. But recompetition is not an option.

So based on this review that will happen in April, the program will provide direction to the hub for its renewal proposal. And we have requested full funding for the hub, but that is a placeholder. Once we know what direction we have given to the hub management, we will inform this committee.

Mr. SIMPSON. So if those are the options, full funding or defunding, dehubifying, whatever you want to call it, or anything in between——

Ms. DEHMER. Anything in between.

Mr. SIMPSON [continuing]. Does that suggest if we—what do you do if you have a subject matter that is potentially very, very valuable, like this Joint Center for Artificial Photosynthesis? Let us assume that that is a subject we ought to be investing in and so forth, but the hub just does a poor job, so you want to defund it. You still have the subject that you think is important. You don't recompete it? You just say, we picked the wrong subject? I don't know that I am explaining it well.

Ms. DEHMER. No. I do understand what you are saying.

I don't think that will be the outcome, first, knowing a lot about this particular hub.

There may be areas within the hub that are extremely high functioning and ought to continue. The entire hub might well ought to continue, but you have to—one thing that is important to understand is that this hub is built on an incredibly large research portfolio that the Basic Energy Sciences Program funds in artificial photosynthesis, essentially in all of the small components of artificial photosynthesis, light absorbers, catalysts, so forth. And this is completely hypothetical and has nothing whatsoever to do with how this hub will review.

Mr. SIMPSON. My question was hypothetical, too.

Ms. DEHMER. But, for example, let us say there were a hublike entity, and we discovered after 5 years, after the 5-year review, that there were parts of it that were so important and had made such great progress that we had to continue those. We could probably continue it within the existing hub, or we could have some kind of other activity, you know, a set of small Energy Frontier Research Centers that work on pieces of it.

So I think that what the Secretary of Energy's Advisory Board was saying is keep your options open. Not everything needs to be a hub. Don't start over, trying to build up all the same infrastructure all over again after 5 years. And consider how this particular funding mechanism might work as we go into the future.

Mr. SIMPSON. The batteries and energy storage hub is also in the Office of Science——

Ms. DEHMER. Right.

Mr. SIMPSON [continuing]. But was funded in fiscal year 2012 and awarded at the Argonne National Laboratory. This battery hub also involves four other national labs, five universities, and four companies.

While the strong interest is encouraging, this does leave us wondering whether the involvement of 14 entities will spread funds thin and create a hub under 14 roofs. And is this what we were originally talking about when we were talking about hubs, trying to bring things together under one roof for a single subject?

Ms. DEHMER. Some of the 14 are very small partners. I think, looking at the experience of the Energy Frontier Research Centers, honestly, I had thought that they are small, they are 2- to $5 million. I thought that they would be largely under-one-roof entities, and it turned out that they are not. And they work extremely well.

The challenge when you have multiple entities is management. The management has to very strictly and very sternly use the partners in a way that you get an outcome in the requisite period of time. The hub itself, or the Energy Frontier Research Center itself, cannot be a funding agency that doles out money to 14 partners. It has to be a strongly organized, centrally managed entity that pulls basic research in from its partners in order to produce a product.

Mr. SIMPSON. Okay. Thank you.

Ms. Kaptur.

Ms. KAPTUR. I am going to switch to a totally different plain here for a second.

When we were out at Berkeley Livermore, Congresswoman Barbara Lee of Oakland joined us for some of those meetings. And we were very enthralled with all of the work being done on the expanding universe there and the laser research nearby, and left viewing the property on which a $100 million solar research facility would be built.

But one of the topics that we discussed was the growing social and commercial bifurcation in our own society, and those that have meager options, and the pull that is occurring within this country right now in many, many communities. And we began to engage in a discussion about how the Department of Energy and its vast research resources might serve as an integrator of capabilities that could help improve life in some of the most forgotten corners of this country.

And we wrote a letter to the Department of Energy and to Livermore, and we got a very good answer back, and this letter came from the Congresswoman and myself. But we have a bit of a coalition going here in the House including Congresswoman Fudge of Cleveland; Congressman Fattah, who was here this morning, from Philadelphia; and Congresswoman Moore of Milwaukee. We are finding we share some similar challenges, including many places where there are nutrition-short communities in this abundant society, and where many individuals live right at the edge.

And so we started thinking about how we could restore on the nutrition front the ability to grow and raise product, and to create a growing system that would be the most energy and water efficient that exists anywhere in the world. And you could almost roll it into any neighborhood, attach it to any church, put it up on a lot. And you would think the Department of Agriculture would be doing this, but I guarantee you they are not.

And even thinking about advanced systems that are very cost-effective, but, for example, where the covering, whatever that might be, might be a thin, multilayer creation that would have energy capability, and where the source of water would be well timed, and you would literally have an easy production platform.

So the reason that I am asking this question is when we went to Argonne a few weeks later, it was so interesting, because I don't think the people at Berkeley told them what we were interested in, but they presented us with this brochure about revitalizing urban America, having a role in the redevelopment of urban communities. It was interesting to go through that. So Argonne is involved, making an effort in the Chicago area.

And my question to you really is is there a way for you to take a look at the letter that we wrote to Berkeley, what Argonne is doing, and develop a dialogue with the Department to find a way to pinpoint some of these smaller efforts in these communities that we are talking about, and to develop a concept that would really be breakthrough that we could use in this country and, frankly, globally? And that is really, I think, something that I would like the Office of Science to consider. If a couple of your labs are already doing some things out there—Mr. Fattah talked about weatherization and some of the new energy-efficient technologies that can be integrated into our urban communities and some of our rural communities that are living at the raw edge.

I wanted to mention that to you, because I think we want to grow, we want to grow this effort, and we want to see what the Department of Energy and its incredible scientists could offer to meet the other half of America that is not able to travel to Berkeley or to Argonne and to see what I saw, and would very much appreciate your attention to the letter that we sent and some of the materials we are gathering now from the Department. Perhaps you could find a way to help us integrate our approach.

Ms. DEHMER. I am happy to do that. I know that Argonne National Laboratory is working with the City of Chicago and the University of Chicago to reach out and look at some of these issues. I am happy to look at that.

Ms. KAPTUR. Thank you.

Thank you very much, Mr. Chairman. That is my last question.

Mr. SIMPSON. If there are no other questions, I thank you, Doctor, for being here today. We look forward to working with you on these fascinating projects that, frankly, I don't understand, but I do like to listen to them.

Thanks for all you do, and we look forward to working with you. I am sure that there will be some questions that will be submitted. If you could return them within 4 weeks, because we are going to start trying to mark up our bill relatively early, so your input would be very valuable.

Adjourned.

QUESTIONS FOR AGENCY SUBMISSION

SUBCOMMITTEE ON ENERGY AND WATER DEVELOPMENT
HOUSE COMMITTEE ON APPROPRIATIONS

DEPARTMENT OF ENERGY OFFICE OF SCIENCE
FISCAL YEAR 2015 BUDGET HEARING

MARCH 25, 2014

STRATEGY AND PROGRAM MANAGEMENT

PRIORITIZING FUSION WITHIN THE OFFICE OF SCIENCE

Subcommittee. Dr. Dehmer, you know as well as anyone that striking a balance among our science priorities is not easy. Within the fusion program especially, finding the right mix between our domestic fusion program and ITER, the international fusion experiment, can be particularly difficult. Both domestic fusion and ITER are important. We must participate in ITER for our domestic fusion program to be relevant, and our domestic program must be strong to allow our scientists to take advantage of ITER once it's brought online.

Unfortunately, this year's budget request funds neither the domestic nor the international program sufficiently. The fusion program as a whole is cut by $90 million, or 18 percent, from the level enacted in last year's omnibus appropriations bill, reducing the domestic fusion program by $40 million and ITER by $50 million.

If ITER is such a priority for the Science program—and we have been told that it is one of your top priorities across all disciplines—shouldn't this prioritization be reflected at the program level? Why does the Administration continue to propose substantial reductions to the Fusion Energy Sciences budget?

Dr. Dehmer. The proposed funding level for the Fusion Energy Sciences program is sufficient to meet our ITER obligations in FY 2015 and to enable FES to be highly competitive on the world stage in both magnetic fusion and discovery-class science. This request supports the U.S. ITER Project Office for R&D, design, and procurement; as well as the U.S. cash contribution to the ITER Organization; and the fabrication of key U.S. in-kind hardware contributions.

The recent Management Assessment of the international project revealed significant shortcomings. The Administration agrees with the ITER Management Assessment's findings that the management of the international ITER Project must be significantly improved for ITER success. We believe that the ITER Organization needs to adopt and execute all of the Management Assessment's recommendations. We continue to apply the project management principles of DOE Order 413.3 to the U.S.

ITER Project, and we will assess the U.S. ITER project annually. We are monitoring the actions of the ITER Organization and the ITER Council closely. The proposed funding level will ensure that U.S. in-kind contributions maintain U.S. commitment to FY 2015 project needs, consistent with the priority placed on project success.

NEW FACILITIES COMING ONLINE AND FACILITY CLOSURES

Subcommittee. Dr. Dehmer, several major facilities or upgrades are under construction and slated to come online in the next several years. These include the National Synchrotron Light Source-II at Brookhaven National Lab, the Linac Coherent Light Source-II at Stanford, the upgrade to the accelerator facility at Thomas Jefferson Lab, and the Facility for Rare Isotope Beams at Michigan State. These facilities promise cutting-edge science capabilities, but also will require hundreds of millions of dollars to operate.

As these facilities come online, you will likely be under a flat budget. Where will you find savings to pay for these new operating budgets?

Dr. Dehmer. The decades-long history of the Office of Science shows that both research programs and facilities have been terminated in order to pursue the most promising new investments in research, tools, and major facilities. Such transitions are made in both flat and increasing budgets. Recent budget requests demonstrate the Office of Science's willingness to make the difficult decisions to close long-running user facilities in order to realize new investments: in recent years the Office of Science closed the Tevatron at FNAL, the Holifield Radioactive Ion Beam Facility at ORNL, and the Intense Pulsed Neutron Source at ANL. However, we believe that the FY 2015 Budget with modest growth would provide the resources for the Office of Science to successfully deliver our highest priority investments in new and upgraded user facilities while continuing to serve today's mission needs.

Subcommittee. As budgets have tightened, it's become increasingly difficult over the last several years to meet all of the construction and operating budget needs for facilities across the Office of Science. It is especially difficult for us to make wise decisions when we only have your budget proposal to analyze—something that makes little sense, given the multi-year nature of construction projects and operating budgets, as well as grants that can mortgage future-year funds. Can we expect to see a five-year plan from the Department with its future construction needs?

Dr. Dehmer. This year's request proposes to phase out the National Synchrotron Light Source (NSLS) at Brookhaven Lab in New York to bring its successor – NSLS-II, which will be the world's most advanced synchrotron light source – online in fiscal year 2015. The request also proposes to terminate the Lujan Neutron Scattering Center at Los Alamos National Lab, which is a major user of Los Alamos' proton accelerator LANSCE [pronounced "lance"] that is also used to support the NNSA's Stockpile Stewardship Program.

Subcommittee. Can you explain to us how you arrived at these decisions? Why is Lujan a lower priority within the BES program?

Dr. Dehmer. When construction of the Spallation Neutron Source (SNS) at Oak Ridge National Laboratory commenced in the mid-1990s, it was anticipated that the lower power and smaller capacity pulsed neutron centers—the Intense Pulsed Neutron Source (IPNS) and the Lujan Center—would ultimately be superseded. Operations at IPNS ended in 2008. Our decision to propose ending operations at the Lujan Center in Fiscal Year 2015 reflects the fact that the SNS has demonstrated the design specification for beam power on target, achieved reliable operations in excess of 1 MW, and is nearly fully instrumented. The Department's other high-energy neutron scattering source, the High Flux Isotope Reactor (HFIR) at Oak Ridge National Laboratory, is also fully operational. Together, SNS and HFIR provide complimentary, flexible, world-class neutron scattering research tools that serve U.S. scientists and adequately address DOE mission needs.

The decisions to close the Lujan Center and the National Synchrotron Light Source (NSLS) are consistent with the facility prioritization advice provided by the Basic Energy Sciences Advisory Committee in February 2013, which ranked the Lujan Center and NSLS as "lower priority," the lowest rating available to the committee. The Lujan Center and the National Synchrotron Light Source were the only two facilities to receive the lowest rating, and we propose to cease operations of both facilities in FY 2015.

Subcommittee. How do you think the shutdown of Lujan will affect LANSCE, and did you take those potential impacts into account when formulating this year's budget request to terminate the facility?

Dr. Dehmer. The Lujan Neutron Scattering Center is one of five facilities that make use of the LANSCE accelerator complex; the other four facilities are the Isotope Production Facility (IDF), Proton Radiography (pRad), Ultra-Cold Neutrons (UCN) and Weapons Neutron Research

Facility (WNR). The Lujan Center is a “stand alone customer” for the LANSCE accelerator complex, so the cessation of operations at the Lujan Center does not affect the operation of the four other facilities connected to LANSCE.

Subcommittee. The National Nuclear Security Administration (NNSA) is the other major user of this facility. What is NNSA’s position on the shutdown of the Lujan portion? Is there any proposal for NNSA to take it over?

Dr. Dehmer. NNSA will continue to operate the Weapons Neutron Research Facility (WNR), which has neutron flight paths in an independent building and three flight paths in the Lujan Center building. The operation of WNR can continue independent of the cessation of operations at the Lujan Center. SC and NNSA are discussing plans for the future of other instruments in the Lujan Center.

SECURITY AT BUILDING 3019 AT OAK RIDGE NATIONAL LAB

Subcommittee. Dr. Dehmer, Building 3019 at Oak Ridge National Laboratory has been an issue of particular concern over the last several years as we look deeper into security across the Department. This building stores Uranium-233, which could be used to produce nuclear weapons and must be kept secure. While the Office of Environmental Management is responsible for the disposal of materials and cleanup of the site, the security of the site falls to your office.

Dr. Dehmer, to the extent that you can discuss them, what specific issues were uncovered regarding security at building 3019, and what progress has the Office of Science made in securing building 3019?

Dr. Dehmer. After the July 2012 security incident at Y-12, the Secretary ordered reviews of the security posture of the twelve DOE Category I special nuclear materials (SNM) facilities located across the DOE complex, including Building 3019. The Office of Health, Safety, and Security (HSS) and the Office of Science conducted four assessments of security at Building 3019 from October 2012 to February 2014. Each review indicated that the nuclear material was protected.

In response to the reviews, SC has initiated activities designed to clarify authorities and responsibilities, improve integration of the contractor and Federal entities, move Oak Ridge towards a learning culture, improve Federal oversight, identify opportunities to accelerate disposition of the material, and increase rigor in "security basis" documentation and searching for efficiencies. Examples include:

- Established clear roles and responsibilities for S&S management, operations, and oversight aligned with appropriate line management authorities and executed associated staff training.
- Selected a contractor, National Strategy Protection Services (NSPS), to provide security protective services for ORNL including Building 3019, the East Tennessee Technology Park, and facilities within the town of the Oak Ridge.
- Developed processes to ensure that the three contracts focused on Building 3019 S&S remain aligned and integrated and reflect current requirements.

- Established a Building 3019 Independent Team, under the leadership of an SES manager, to ensure that a comprehensive and integrated corrective action plan was developed, to provide independent perspectives and feedback, and to ensure effective federal corrective actions are implemented.
- Tested physical security system enhancements, including cameras, noise deterrents, and improved assessment tools, which are being incorporated to reduce the false and nuisance alarm rates at Building 3019 and increase efficiency.

The HSS follow-up assessment of Building 3019, completed in February 2014, noted that there has been significant improvement in the overall security posture at Building 3019, recognized that the Office of Science has established one of the most rigorous S&S Survey Programs in the Department, and acknowledged the highly proficient equivalency/exemption renewal process. However HSS also identified areas that still need management attention to address lower threshold threat scenarios, improve performance testing, and improve the response in performance and coordination of the Special Response Teams (obtained from Y-12) when responding to an event at Building 3019.

Subcommittee. The building will need to be secured as long as U-233 and other materials remain on-site. How much is the Office of Science expecting to spend to secure Building 3019 until the sensitive materials are moved out, and when can we expect to see these materials packaged and moved out of this site?

Dr. Dehmer. The security budget for the Protective Force designated for protection of Building 3019 is approximately $6 million per year. Additional investments in physical security to address system upgrades are borne by the Office of Science and vary based on protection needs. These costs are expected to continue until the disposition of the higher risk nuclear material.

The operators at Building 3019 are poised to ship the Consolidated Edison Uranium Solidification Project (CEUSP) material, and the Department is working with the State of Nevada through a joint Nevada/DOE senior working group to address concerns raised by the state about the disposal of the material at the Nevada National Security Site. The Department has conducted public meetings in the communities around the Nevada site. The next working group meeting is scheduled for May 2014. Completion of the CEUSP material disposal will reduce inventory in Building 3019 by half. The remaining U233 heterogeneous material will require processing and down blending prior to disposal. Conceptual design work associated with this down blending operation has been initiated. The current planned completion date for the U233 Project is FY 2024. SC and EM agree that the expedited removal and ultimate disposition of the U233 material is the best method to reduce the security needs for Building 3019. The Department is currently developing the Congressional Report required by the FY 2014 Consolidated Appropriations Report Joint Explanatory Statement, which will provide a life-cycle cost estimate for completing removal of the U233 inventory from Building 3019 by 2019.

Subcommittee. Just last year we were hearing about the progress being made in getting these materials out. What has happened since then to slow things up, and what is being done to address the situation?

Dr. Dehmer. DOE was prepared to begin shipments of CEUSP to the Nevada National Security Site in June 2013. However, these shipments are on hold as the Department and the State of Nevada continue to discuss concerns raised by the State. The Secretary met with Governor Sandoval in August 2013 when they formed a joint Senior-level DOE/NV Work Group to address the State's concerns, and the working group has met several times since its formation. The next working group meeting to address remaining concerns is scheduled for May 2014.

FUSION ENERGY SCIENCES

THE IMPORTANCE OF A LONG-TERM FUSION PLAN

Subcommittee. Dr. Dehmer, this Committee has grave concerns about the Administration's proposal for Fusion Energy Sciences in the budget request, because it cuts the program by 18 percent without offering any vision for its future. The fusion program remains important to our nation's ability to compete in science and engineering, and to our future energy sector, and we must chart a viable path forward.

Last year's omnibus appropriations bill includes a directive for the Fusion Energy Sciences Advisory Committee to develop a long-term plan and a set of priorities based on several different funding scenarios that this Committee determines to be realistic. Can you describe for us how the work to develop that plan is going?

Dr. Dehmer. The Office of Science fully intends to respond to this requirement for a strategic plan. The Office of Science has prepared a charge to the Fusion Energy Sciences Advisory Committee (FESAC), and this charge will be officially delivered to FESAC at its meeting in April 2014. A FESAC subpanel will be put in place to work on this prioritization; this process will include hearing from stakeholders their own views on priorities. The FESAC report will serve as input to be considered by the Administration as it composes a strategic plan, which we will submit to Congress in fulfillment of the requirement.

Subcommittee. What do you believe are some options for moving the domestic fusion program forward in a meaningful way?

Dr. Dehmer. The FY 2015 budget request supports a research portfolio that positions the U.S. to be highly impactful on the world stage over the next decade. The request sustains significant investments in U.S. core strengths across a variety of research areas.

Continuing U.S. leadership will build on strengths that exist at Princeton Plasma Physics Laboratory (PPPL), the sole program-dedicated laboratory in plasma and fusion sciences; on operation of world-class facilities at PPPL and General Atomics; on leadership in fusion simulation and materials sciences; and on strong partnerships with unique foreign fusion research facilities.

AN INADEQUATE REQUEST FOR DOMESTIC FUSION

Subcommittee. Dr. Dehmer, last year's budget request proposed to reduce the domestic fusion program by $64 million, or 21 percent, and to terminate the MIT facility. This Committee rejected those proposed reductions. This year's request once again proposes to reduce the domestic fusion program – this time by $40 million, or 13 percent. I applaud the Department's decision to bring the MIT facility to a close over the coming years, but the domestic fusion energy budget as a whole is entirely insufficient to support this nation's leadership role in fusion sciences.

In fact, the last time the Office of Science charged the Fusion Energy Sciences Advisory Committee, the scientific body that advises the Department on the fusion program, to develop priorities for the domestic fusion program, that advisory committee reported back that the Department's 2013 request of $257 million was, and I quote, "inadequate to address even the highest priorities in a timely way."

Do you feel that this year's request allows you to support this nation's leadership role in fusion sciences while many other countries invest heavily? How can this Committee best support our domestic fusion program and its facilities?

Dr. Dehmer. The budget request for FY 2015 will lead to a program that is highly impactful on the world stage, with world-class large-scale magnetic fusion facilities, vigorous and well-targeted international partnerships that leverage U.S. expertise, and a wide range of innovative university programs in the fusion and plasma sciences that serve the research and educational needs of over 350 students nationwide.

INADEQUATE SUPPORT FOR ITER

Subcommittee. In this year's budget request, the Administration proposes to reduce the U.S. contribution to ITER to $150 million in fiscal year 2015. Just last year, the Administration proposed $225 million to meet our scheduled commitments for the same project and received $200 million in the fiscal year 2014 omnibus appropriations bill.

Dr. Dehmer, what has changed since last year? How will this year's request to cut $50 million from ITER impact last year's plan to complete the U.S. contributions, and when do we expect to complete delivery of our contributions to the project?

Dr. Dehmer. The Administration's proposed $150 million budget reflects U.S. concern about the pace of the project and the project management as documented by the 2013 Management Assessment (MA). This budget request allows the U.S. to meet its hardware and cash commitments for FY 2015. The U.S. will continue to assess the operation of the project on an annual basis.

Subcommittee. When can we expect to see a final DOE project plan and data sheet for our contributions to the ITER project? Do you think it's wise to ask the Committee to cut ITER without knowing the impacts it could have on our international commitments?

Dr. Dehmer. The U.S. would incur substantial risk by baselining the U.S. ITER Project prior to the creation of a realistic international schedule by the ITER Organization (IO). The intention of the IO is to complete such a schedule by June 2015.

Subcommittee. Will this delay impact ITER's timeline as a whole? Will this level of support for ITER not raise a lot of eyebrows in the international community, since all of the other participant countries have committed their funding?

Dr. Dehmer. Without a realistic international schedule, the impact of the U.S. delivery commitments to the ITER project is unclear. As reluctantly as some have come to this conclusion, it has become clear that the ITER Organization and the Members need to significantly improve the management of the overall ITER project.

Subcommittee. Some have suggested that other areas of science and energy should take priority and we should withdraw from ITER. What portion of the ITER project are we contributing, and what would be the consequences of withdrawing?

Dr. Dehmer. Most of the U.S. contribution is in-kind hardware. The U.S. contributes 9.09% of the project scope during the construction phase, which includes our in-kind contributions and our share of common expenses for the ITER organization and for installation and assembly of the machine. According to the terms of the ITER Joint Implementing Agreement, withdrawal from the Project does not relieve a Member of its obligations to the Project.

Subcommittee. Do you see any evidence that any of ITER's partner countries will not meet their expected financial commitments, or are all of their commitments holding firm?

Dr. Dehmer. We have not seen evidence that other Members will not meet their financial commitment; however, there is a long construction period ahead, and we cannot speculate on the future.

Subcommittee. If ITER works as intended, what are the steps between ITER and commercialized fusion power, and at what cost?

Dr. Dehmer. Research will be needed to address remaining scientific and technological questions in fusion materials and closing the fusion fuel cycle. Then a fusion "demo" reactor that puts power on the grid will be required prior to construction of a commercial power plant. Both "demo" and a commercial power plant would be nuclear facilities and thus would require substantial investment.

BASIC ENERGY SCIENCES

FLAT BUDGET SCENARIO

Subcommittee. The Basic Energy Sciences [BES] program budget consists of funding for research, the operation of existing user facilities, and the construction of new facilities and equipment. The long-term success of the BES program hinges on striking a careful balance among these three areas. However, the increasing level of research commitments, higher operating costs, and new construction make it difficult to adequately fund all three components within existing budget constraints. Anything short of a considerable increase for BES will force us to decide which activities or facilities to shrink — or in a few cases, which to terminate.

Dr. Dehmer, this year's request solves BES' dilemma by increasing its budget at the expense of other programs. Given the constraints this Committee is operating under, how will the BES program fare in the event of a flat, or even decreasing, budget scenario?

Dr. Dehmer. If the BES budget is held flat with FY 2014, we would continue with the highest priority activities, among them the LCLS-II and the APS upgrade. Reductions would be necessary, and we would seek appropriate advice.

Subcommittee. If you have to live within existing budget levels, what would you cut in order to fund your top priorities within this program?

Dr. Dehmer. As noted previously, many BES activities are among the highest priorities in the Office of Science, and, as demonstrated in this budget submission, the BES budget is increased at the expense of other activities. We have proposed one closure in the BES budget, the Lujan Neutron Scattering Center. We would adhere to prior advice and seek new advice if additional reductions or terminations were required.

ENERGY FRONTIER RESEARCH CENTERS

Subcommittee. The 46 Energy Frontier Research Centers (EFRCs) established in 2009 completed their 5^{th} and final year of funding in fiscal year 2013. Last year's omnibus appropriations bills provided $100 million to continue this program, with the 16 additional centers funded by the 2009 stimulus not being renewed.

Can you tell us how the Office of Science is moving forward with EFRCs in fiscal year 2014? Do you plan to simply extend some or all of these centers, or are you holding a competition for which existing EFRC's can apply?

Dr. Dehmer. The initial 5-year project period for the current 46 EFRCs ends on July 31, 2014. An open recompetition of the entire EFRC program is taking place in FY 2014. A Funding Opportunity Announcement (FOA) was issued on September 30, 2013, with a proposal submission deadline of January 9, 2014. The FOA encouraged renewal proposals as well as applications from groups proposing new EFRCs. New and renewal awards will be selected based on peer review by external experts. All of the current EFRCs, including those funded through the Recovery Act, have an equal opportunity for renewal in this competition.

Subcommittee. Can new EFRC's apply?

Dr. Dehmer. Yes, new EFRCs were eligible to apply in response to the FOA and many did.

Subcommittee. It's important to remember that EFRC's did not exist before 2009. And as with any new program, we must constantly evaluate their success and ensure that momentum is not the only reason they continue to be funded. Dollar for dollar, how do the EFRC's stack up against other modes of research at the Department?

Dr. Dehmer. In 2012, DOE conducted a midterm scientific peer-review of all 46 EFRCs. External reviewers found that as a portfolio the EFRCs had high productivity and demonstrated world leadership; enabled high-risk, high-reward research that would not otherwise be attempted; brought together synergistic, cross-disciplinary teams that challenged their members to ask more difficult questions, leading to potentially transformational results; and accelerated the rate of both success and failure, from which lessons were rapidly learned and adjustments quickly made.

At the end of FY 2013, after four years of research activity, the 46 EFRCs had produced an impressive breadth of accomplishments, including over 4,000 peer-reviewed journal papers, over 200 patent applications and over 90 additional patent/invention disclosures. EFRC students and staff have gone on to work in more than 215 university faculty and staff positions, more than 340 industrial positions, and more than 130 positions at national labs, government and non-profit organizations. Nearly 60 companies have benefited directly from EFRC research.

The EFRCs stack up well against other modes of research at the Department. Recently, the Secretary of Energy Advisory Board assessed the EFRCs, the Energy Innovation Hubs, the Bioenergy Research Centers, and ARPA-E and concluded that the EFRCs are appropriately scoped and funded for the basic, innovative research that they pursue.

COMPUTATIONAL MATERIAL SCIENCES

Subcommittee. For computational material sciences, the request proposes $24 million for a new activity that would support four large teams of scientists and engineers to conduct basic research and develop software codes for the design of functional materials.

Can you explain to us what this new research activity will accomplish, and why is it important for the Basic Energy Sciences program?

Dr. Dehmer. The computational materials sciences activity will support research that transcends simple extensions of current theory and models of materials discovery and design. The proposed activity would support up to four integrated theory-computation-experimental teams to develop and deliver community codes and research-oriented software for predictive design of functional materials. Teams will focus on different aspects of functional materials, such as strongly correlated matter, conversion of solar energy to electricity, design of new catalysts, and transport in materials for improved electronics. The research will include development of new theory, mining experimental and theoretical databases, performing in situ and in operando characterization to generate the specific parameters needed for computational models, and confirming predictions with well controlled synthesis.

The proposed research will leverage recent advances in materials synthesis, processing, and characterization, and concurrent advances in computational science, enabled by DOE's high performance computing capabilities. Many of the underlying phenomena require understanding the dynamics at ultrafast time scales and with near atomic resolution, which will require the sophisticated instrumentation at DOE's user facilities. The Office of Science is uniquely positioned to seize this opportunity.

A number of community-based strategic planning activities and reports have strongly supported increased investment in computational materials sciences, and in particular, the need for software tools and associated databases. Today, the leading and dominant materials applications (VASP and Themo-Calc) were developed and commercialized by European companies and require hefty licensing fees. The licenses often do not include access to the source code, making it impossible to tailor the codes to suit the individual applications. In addition, the codes are not designed for parallelized computing platforms that we use today.

ADVANCED SCIENTIFIC COMPUTING RESEARCH

EXASCALE COMPUTING

Subcommittee. The "Exascale initiative" has been the major thrust of the Office of Science's computing programs over the last several years. For the benefit those in this room who, like me, aren't computer scientists, exascale computers would be about one thousand times faster than today's fastest systems.

Can you briefly explain how exascale computing differs from how today's supercomputers function?

Dr. Dehmer. The exascale computer will be able to do calculations approximately 1,000 times faster than petascale computers. DOE's goal is to develop capable and strategically high-impact exascale computing platforms that will not only perform operations substantially faster than today's highest-performing systems, but provide substantially improved application performance. These systems will enable more precise models of very large complex systems—some of which have been inaccessible or, by necessity, have been greatly simplified so that they could run on petascale systems. In other words, this increase in capability doesn't just mean less time spent doing calculations; it means that the computer models we use to predict phenomena for discovery science and engineering can be that much more realistic.

Our goal is to deliver this capability with power and size footprints similar to that of our current systems. Of equal importance are our investments to develop the computer science tools, software, and methods for scientists and industry to more effectively use these future high performance computing systems.

Subcommittee. What are the major technical challenges?

Dr. Dehmer. To understand the challenges of developing capable exascale systems, it is important to realize that the performance of today's computers can no longer be increased in the manner of the past decades, i.e., by decreasing the feature size of processors and memory. The new ways of increasing performance will require that computers are designed so that computer scientists, system architects, programmers, and users are involved. The most significant challenges include the following:

1. Billions of processors in next-generation computers present two technical challenges: the first is making all the processors work together and the second is to make sure that one bad processor does not crash the system or corrupt the answer.

2. Developing energy efficient computers is a challenge spanning hardware, software, and application efforts. Improving energy efficiency will have big payoffs in the operating cost of our facilities, for the broader scientific community, and for the U.S. computing industry. Lowering the energy footprint of computing helps at all levels—from laptops to supercomputers.

3. For computers to be useful for next-generation scientific and engineering simulations, memory capacities must be increased. Memory and storage technology have not, historically, progressed as fast as processor technology and use a significant amount of power. This challenge is not unique to scientific computing, and advances in this area will also benefit computing more broadly.

Subcommittee. Last year we heard a number of dates thrown around for the Department's target timeframe for developing an exascale computing system. What is your current target date for completing an exascale system, and is that supported by this year's request of $91 million in Science and $50 million in NNSA?

Dr. Dehmer. The request of $141 million supports the joint plan of SC and NNSA to continue our preparations for a program to achieve exascale by 2023.

Subcommittee. What does the nation gain from a large investment in exascale computing – what will we able to do that we cannot today?

Dr. Dehmer. We are doing a great deal with today's leadership computing systems. However, in many cases we are modeling parts of systems and piecing models together and modeling simplified, or "proxy," systems. For example, we have been using experiments and computers to model combustion for decades with the goal of improving efficiency and reducing pollution. The early models approximated simple laboratory flames. Today's systems can model hydrocarbon combustion in fairly simple geometries, but we still cannot model more complex fuels and geometries such as biofuels in jet engines. The Department has many complex systems for which we need to predict long-term behavior—such as the electricity grid, advanced reactor designs, materials under extreme conditions, new energy storage devices, and the reactive transport of contaminants in groundwater.

Investments for exascale computing will allow for greater fidelity in the models, more realistic predictions, and more realistic answers to questions of critical importance to the DOE mission, scientific progress, and industrial growth.

GLOBAL COMPETITION FOR THE WORLD'S FASTEST COMPUTERS

Subcommittee. The United States has been a leader in advanced computing since the industry's invention, and we have dominated the list of the world's fastest computing systems in that time. The Office of Science's advanced scientific computing systems used for cutting-edge research have been at the top of that list for many years.

But over the last decade, others such as China, Europe, and Japan have ramped up their investment in advanced computing, and we've been neck-and-neck with these in the last several years.

Dr. Dehmer, can you sum up what the competitive landscape looks like right now for advanced computing, and how the U.S. fits in?

Dr. Dehmer. Global competition in high performance computing is real and, as you noted, China, Japan, and Europe are our primary competitors. According to the November, 2013 Top 500 list of the most powerful supercomputers in the world, the United States has five machines in the top ten. Titan at Oak Ridge is number two at 27 petaflops. China remains at the top of the list with the 54 petaflop Tianhe-2. The other machines in the top 10 are the 11 petaflop K computer from Japan and three systems from Europe. Although the current Chinese top-rated computer has a mix of U.S.-based and China-based chips, China as well as Europe have stated goals for their next-generation computers to be based on indigenously designed chips. In addition, China has announced its intention to train approximately one million computer scientists by 2020.

Leadership in high performance computing and computational science affords the ability to define industry standards, maintain control of critical hardware manufacturing, and be the first to confer advanced computing capabilities to domestic industries and research.

Subcommittee. How much of the United States' performance in this arena is driven by federal investment through the Office of Science and other agencies?

Dr. Dehmer. The U.S. has a history of successfully advancing the frontier of high performance computing. The forefront computational systems leading these advances have always been the result of government-industry partnerships. The Department of Energy worked with U.S. vendors to develop and deploy the first terascale systems in the late 1990s and the first petascale systems in the beginning of this century.

Subcommittee. Can you discuss how other science programs gain new capabilities through the Office of Science's high performance computing?

Dr. Dehmer. Robust partnerships among application scientists, computer scientists, and mathematicians are the key to ensuring other science program missions benefit from high performance computing. The Scientific Discovery through Advanced Computing (SciDAC) program was established in 2001 to foster such partnerships. This program has dramatically improved the ability of the other programs to gain scientific insights from high performance computing and effectively use leadership resources. For instance, through SciDAC-2, combustion researchers created a new method of producing high fidelity models of direct injection processes for automobile engines, produced tools to manage petascale data archives and make them available to other scientists, and increased the efficiency of fusion simulation codes. Today SciDAC-3 partnerships are developing codes to improve energy storage technologies, new high performance computing software and tools to advance new designs, concepts and technologies for particle accelerators research and high-performance predictive models to guide research on next-generation fusion facilities. Staff at the Office of Science's Leadership Computing Facilities have also been very effective in preparing users from across the open science community, including industry, to take advantage of the capabilities available. Today, in the physical and engineering sciences, the use of advanced simulation techniques and, increasingly, big data analytics, are ubiquitous and integral to both experiment and theory—future advancement in these areas is inextricably linked to advances in next-generation computing and simulation science.

HIGH ENERGY PHYSICS

POSSIBLE REDUCTIONS AT FERMILAB

Subcommittee. Dr. Dehmer, this year's request cuts the High Energy Physics program by $54 million below the fiscal year 2014 level.

Will these proposed reductions result in workforce reductions for Fermilab, the major lab within the High Energy Physics program?

Dr. Dehmer. Reductions for construction projects are not expected to have a significant impact on staffing. Much of the staff will be redirected to work on the Basic Energy Sciences sponsored LCLS-II project being built by SLAC National Accelerator Laboratory. The net reductions to staff, which will be accomplished mostly through attribution, should be no more than 40 to 80 FTEs.

LONG BASELINE NEUTRINO EXPERIMENT

Subcommittee. Dr. Dehmer, with the shutdown of the Fermilab's Tevatron several years ago, there is now no major facility operating in the United States that focuses on High Energy Physics, a wing of physics that explores the basic model of the fundamental particles of matter. Europe's standard bearer in this area is the Large Hadron Collider, which discovered the Higgs particle last year. Some say that the Long Baseline Neutrino Experiment, if built, could keep the United States at the forefront of the field.

Would the LBNE keep us as leaders in the High Energy Physics world? How does it compare with the Large Hadron Collider?

Dr. Dehmer. Neutrino physics has been an area rich with discoveries in the last decade. The Long Baseline Neutrino Experiment, as proposed, would be world–leading in neutrino physics with a goal of understanding the still poorly understood properties of neutrinos. The LHC is the world-leading energy frontier facility with the goal of testing the Standard Model by producing and studying new particles such as the Higgs Boson.

Subcommittee. Are we looking for international participation in a potential LBNE project, whereby other nations invest in our facilities?

When the LBNE was originally envisioned, the National Science Foundation was going to build and maintain the Deep Underground Science and Engineering Laboratory, which would house a detector in South Dakota's Homestake mine for a particle beam generator based in Illinois. The NSF has since backed out of the deal, with the Sanford Underground Research Facility (SURF) in South Dakota as its potential replacement.

Dr. Dehmer. Preliminary discussions with other countries indicate that international partnerships would be beneficial to the LBNE project as well as to our potential foreign partners.

When the LBNE was originally envisioned, the National Science Foundation was going to build and maintain the Deep Underground Science and Engineering Laboratory, which would house a detector in South Dakota's Homestake mine for a particle beam generator based in Illinois. The NSF

has since backed out of the deal, with the Sanford Underground Research Facility (SURF) in South Dakota as its potential replacement.

Subcommittee. If the LBNE project moves forward, will SURF officially be used to house the detector?

Dr. Dehmer. Yes. Although other sites were considered, current planning assumes that SURF will be the location of the LBNE far detector.

Subcommittee. We understand that SURF is not technically a DOE facility, and it gets its funding from the State of South Dakota and a variety of other sources. Your office is now providing about $15 million each year for operations at SURF. Who technically "owns" SURF?

Dr. Dehmer. SURF is owned and operated by the South Dakota Science and Technology Authority. DOE sponsored work is funded through a contract with the Lawrence Berkeley National Laboratory.

Subcommittee. What is the funding breakdown for SURF, does it comply with DOE's health and safety requirements, and is there any liability?

Dr. Dehmer. Currently, approximately half of the funding for SURF comes from South Dakota and half from DOE.

LBNL has full time Environment Health and Safety (EH&S) staff on-site to ensure compliance with all the conditions of the contract related to EH&S and DOE's requirements. LBNL established an independent oversight committee charged to review and assess EH&S conditions and performance, which meets regularly at SURF. The South Dakota Science and Technology Authority (SDSTA) established a customized EH&S program formed from DOE, Occupational Safety and Health Administration (OSHA), Mine Safety and Health Administration (MSHA), and state regulations and requirements to ensure the safety program appropriately addresses the unique environments and challenges encountered while working underground. A recent gap analysis of the SDSTA system and DOE's 10CFR851 confirmed the SDSTA's program meets or exceeds the DOE's EH&S requirements. The SDSTA is a State of South Dakota authority, enforcement of EH&S is conducted by the State of South Dakota's Office of Risk Management. Risks related to operation of the facility are managed with the purchase agreement with the SDSTA. The DOE does not incur liability for the facility or its operation.

Subcommittee. Under what conditions will we continue to pay for operations at SURF, and under what conditions will we no longer support it?

Dr. Dehmer. DOE is committed to supporting SURF for the duration of the current HEP-supported Large Underground Xenon (LUX) experiment, which is searching for dark matter, and the Nuclear Physics-supported Majorana Demonstrator. Support beyond the lifetime of these experiments will be linked to future projects. We expect recommendations from HEPAP on this topic over the summer.

NUCLEAR PHYSICS

SETTING PRIORITIES IN NUCLEAR PHYSICS

Subcommittee. Dr. Dehmer, the Nuclear Physics program in your office will likely face some difficult tradeoffs between major facilities in the near future. A flat or shrinking budget within the Nuclear Physics program simply may not be able to support upgrades and operation of two existing facilities—RHIC at Brookhaven Lab and the accelerator facility at Thomas Jefferson Lab in Virginia—while also paying for construction of the Facility for Rare Isotope Beams at Michigan State University. This year's request solves the problem by increasing the Nuclear Physics program by $24 million.

The Nuclear Science Advisory Committee released its results last year and recommended, under a scenario in which the Nuclear Physics program must live within a flat budget, to continue operation of CEBAF at Jefferson Lab, to move forward with construction of FRIB in Michigan, and to shut down RHIC in New York. As the Department searches for a balance among these three facilities, does the Office of Science have a long-range plan for RHIC?

Dr. Dehmer. The Office of Science request includes funds for continued operations at RHIC, which is making a significant contribution the international field of heavy-ion physics. RHIC's science mission remains vital to determining the properties of the new state of matter discovered at RHIC. RHIC has been operational since 2000 and is the only heavy ion collider operational in the United States.

The Nuclear Science Advisory Committee's recommendation was based on flat funding from the FY 2013 appropriation, which was 8.7% below the FY 2014 appropriation and 12.4% below the FY 2015 request. The committee also noted that excising any one part of NP's facilities would "be a significant loss to the U.S. in terms of scientific accomplishments, scientific leadership, development of important new applications, and education of a technically skilled workforce to support homeland security and economic development" and that "It would be a disaster for U.S. nuclear science—a clear short term problem that would likely be the start of a longer term decline of the field as a whole."

Subcommittee. If you have to live within existing or shrinking budgets for Nuclear Physics, what do you think strikes the right balance in order to fund your top priorities within this program?

Dr. Dehmer. Our priorities for NP are to complete the 12 GeV Upgrade, construct the Facility for Rare Isotope Beams and optimize the operations of scientific user facilities.

The level of operations to commission the machine and start the new physics program with the 12 GeV Upgrade could be curtailed, while RHIC operations would be optimized within available funds to continue its world-class physics program and exploit new capabilities recently made available.

BIOLOGICAL AND ENVIRONMENTAL RESEARCH

MEDICAL RESEARCH FUNDED BY THE DEPARTMENT OF ENERGY

Subcommittee. Dr. Dehmer, the Department of Energy has a history of making significant contributions to diagnostic medicine through its work in nuclear medicine, and to projects like the artificial retina. This is a double-edged sword, however. When funds are limited—and they are and will continue to be scarce—the Department must adhere closely to its own mission, which does not include medical applications.

The Department's national laboratories have capabilities that can uniquely advance certain areas of medicine, like diagnostic imaging and certain cancer therapies using radiation and particle accelerators. And while it serves the nation's interests to use those capabilities, fiscal realities demand that funding appropriated to the Department goes towards its core missions—which does not include medicine. This year's budget request proposes to eliminate funding for nuclear medicine research that was included in last year's omnibus appropriations bill.

To what degree has your office explored ways to use the capabilities at your labs, but fund them by the appropriate federal agencies with medical missions? This is done quite often at Department's labs through various "Work for Others" arrangements, and it seems like the right arrangement here.

Dr. Dehmer. DOE's Office of Biological and Environmental Research has a long history of supporting the development of medical technologies including medical imaging and the artificial retina. Today, DOE uses its historical expertise to develop new imaging modalities as part of a broad strategy to use plants and microbes to produce biofuels, to understand the global carbon cycle, and to understand the movement of nutrients and contaminants in the subsurface environment. Just as DOE's expertise in medical imaging technologies have and are being adapted for use in energy-related research, so too the new technologies currently being developed by DOE can be adapted for medical applications by other agencies. In addition, DOE laboratories continue to use their nuclear medicine expertise to assist the National Institutes of Health through their Work for Others arrangements. The Work for Others programs are managed directly by the national laboratories, and overseen by DOE. The Department encourages its laboratories to use this funding mechanism to make DOE expertise broadly available to help meet the needs of other Federal agencies.

WITNESSES